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GROUNDWATER RESOURCES OF THE WILLIAMSPORT REGION, LYCOMING COUNTY, PENNSYLVANIA

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COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL RESOURCES
OFFICE OF RESOURCES MANAGEMENT
BUREAU OF
TOPOGRAPHIC AND GEOLOGIC SURVEY
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by Orville B. Lloyd, Jr., and Louis D. Carswell
U. S. Geological Survey

Prepared by the United States Geological Survey, Water Resources Division, in cooperation with the Pennsylvania Geological Survey

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ABSTRACT

The aquifers that form the groundwater reservoir in the Williamsport region are composed of consolidated fractured rocks and overlying unconsolidated deposits. The fractured rocks consist of carbonate rocks, shale, siltstone, and sandstone that range in age from Ordovician to Pennsylvanian. The unconsolidated deposits are Quaternary in age.

The average yield of wells located and constructed for high yield is about 300 gal/min (gallons per minute) from unconsolidated deposits, 200 gal/min from carbonate rocks, 150 gal/min from sandstone, 100 gal/min from shale, and 75 gal/min from siltstone. The maximum yields that have been obtained range from 2.5 to 10 times these amounts.

Typically, water from the carbonate rocks has a pH of 7.0, is very hard (200 mg/L [milligrams per liter]), and has about 450 mg/L dissolved solids. Water from the noncarbonate rocks generally has a pH of 6.9, is moderately hard (85 mg/L), and has about 150 mg/L dissolved solids. Concentrations in excess of the Environmental Protection Agency standards for iron, manganese, sulfate, chloride, dissolved solids, hydrogen sulfide, barium, cadmium, lead, nitrate, and zinc are found locally.

INTRODUCTION

The objective of this report is to describe the significance, availability, and quality of the groundwater resources of the area to facilitate their efficient development and management. The investigation was done as part of the continuing study of the groundwater resources of Pennsylvania by the U. S. Geological Survey in cooperation with the Pennsylvania Department of Environmental Resources, Bureau of Topographic and Geologic Survey.

The area of investigation is in the north-central part of Pennsylvania and encompasses 480 square miles. It includes 415 square miles in central and southern Lycoming County; the remaining area is in Clinton, Northumberland, and Union Counties (Figure 1).

The southern 85 percent lies within the Appalachian Mountain section of the Valley and Ridge province. The northern 15 percent lies within the Appalachian Plateaus province (Figure 1). The Appalachian Mountain sec-

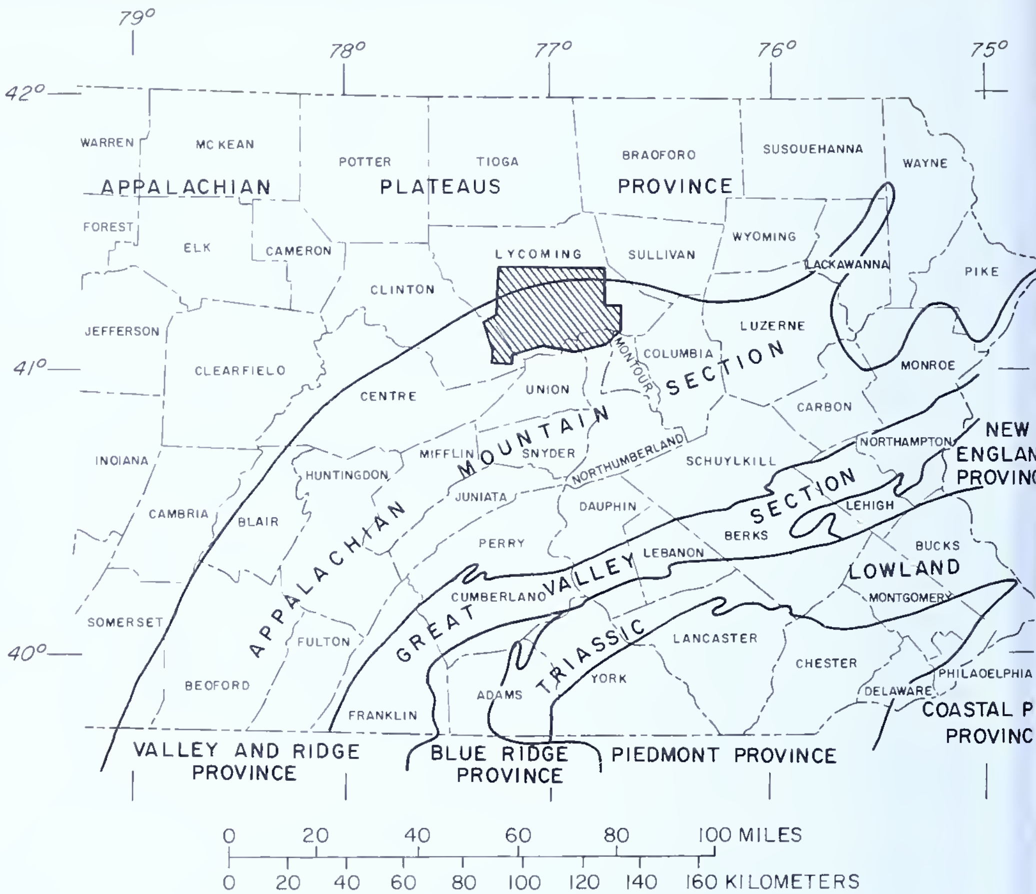

Figure 1. Map of eastern Pennsylvania showing the physiographic provinces and the location of the study area.

tion is underlain by folded and faulted shale, siltstone, sandstone, and carbonate rocks that range in age from Ordovician to Devonian. The Appalachian Plateaus province is underlain by flat-lying sandstone, siltstone, shale, and minor amounts of carbonate rocks that range in age from Mississippian to Pennsylvanian. Most of the area is blanketed with unconsolidated material of Quaternary age.

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The writers thank the many well owners and operators of both public and private water works who supplied information about their wells and allowed their wells to be test pumped and sampled. Water-well records from the following are greatly appreciated:

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Borough of Montgomery
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GEOLOGY

RELATIONSHIP OF GEOLOGY TO GROUNDWATER

An understanding of the geology is necessary to evaluate the groundwater resources because the rocks and weathered rock material constituting the natural system for storing and transmitting water are complex.

The groundwater reservoir consists of (1) unconsolidated deposits of sand, gravel, silt, clay, and weathered rock of variable thickness, and (2) the underlying bedrock.

In the unconsolidated deposits, the water is stored in and transmitted through pores and intergranular openings (primary openings). The character and thickness of this material are important because the water stored here also acts as a source of recharge to the underlying bedrock.

In the bedrock, water is primarily stored in and transmitted through solution openings, bedding planes, cleavage planes, and fractures such as faults and joints (secondary openings). The distribution, interconnection, and size of secondary openings have a direct relationship to the yield of wells pene-

trating the bedrock and depend on the mineral composition and structure of the bedrock.

The mineral composition of the rocks affects the quality of their contained water. Precipitation dissolves constituents from the soil, the unconsolidated deposits, the weathered rock materials, and the consolidated bedrock as it infiltrates to the water table and moves through the rocks in the saturated zone.

GENERAL GEOLOGY

The following discussion is based on geologic mapping by Faill (1979), Faill and others (1977a and 1977b), Wells and Bucek (1980, in press), Denny and Lyford (1963), and Peltier (1949). A generalized geologic section is given in Table 1, a geologic map is shown on Plate 1, and the major structural features and rock systems are shown in Figure 2.

The stratigraphic nomenclature used in this report is that of the Pennsylvania Topographic and Geologic Survey, and does not necessarily conform to the usage of the U. S. Geological Survey.

Most of the consolidated rocks were laid down as unconsolidated deposits in a marine and nearshore marine environment. Some of the Silurian, Upper Devonian, Mississippian, and Pennsylvanian rocks were deposited in a nearshore terrestrial environment.

All of the rocks older than Quaternary age were deformed by compressive mountain-building forces. Adjusting to the stress, the rocks were elevated, buckled, and folded into anticlines and synclines and broken by thrust faults. The axial traces of the anticlines and synclines and the traces of the thrust faults are roughly parallel and strike east-northeast.

The most prominent structural features are the Nippenose and Mosquito anticlines and the White Deer syncline. Early and Middle Ordovician limestone and dolomite, the oldest rocks in the area, are exposed in the core of the Nippenose anticline and form the Nippenose Valley, whereas Middle Ordovician shale is exposed in Mosquito Valley along the core of the Mosquito anticline. The core of the syncline is underlain by Middle and Late Devonian shale and siltstone. The structures are boldly outlined by Late Ordovician and Early Silurian sandstone and quartzite, which form Bald Eagle Mountain and North White Deer Ridge. Those structures and the attendant rocks control the courses of the West Branch of the Susquehanna River and its tributaries south of the river (and the groundwater flow to these streams) from Jersey Shore to Allenwood.

The Middle and Late Devonian shale, siltstone, and sandstone north of the Mosquito and Nippenose anticlines are deformed by smaller, but no less intensely folded, anticlines and synclines. In addition, these rocks contain most of the thrust faults. Some of the major structural features are the Tombs Run and Warrensville anticlines, the Short Mountain and Loyalsock

Table 1. ***Generalized Geologic Section***

System	Series	Formation	Thickness (feet)	Character
Quaternary	Holocene or Pleistocene	Unconsolidated deposit	0–150	Unconsolidated deposits of poorly to well-sorted boulders, cobbles, pebbles, gravel, sand, silt, and clay. These materials were deposited by running water, ice, and gravity.
Pennsylvanian	Middle and Lower Pennsylvanian	Pottsville Formation	0–150 exposed	Light-gray or light-tan, medium- to thick-bedded, very fine to coarse-grained, poorly sorted sandstone, very thin to medium-bedded siltstone; quartz-pebble conglomerate at base. About 10 feet of black, thin- to medium-bedded bituminous coal is present in upper part of exposed formation; top of formation is not present. Coal occurs in five separate beds at one location and is buried by about 32 feet of overburden.
Mississippian	Upper Mississippian	Mauch Chunk Formation	280	Upper part is gray to greenish-gray, very fine to medium-grained, crossbedded, calcareous sandstone. Lower 100 feet is interbedded gray, very fine to medium-grained, silty, thin- to medium-bedded, crossbedded, micaceous subgray-wacke and grayish-red and medium-dark-gray, thin-bedded argillaceous siltstone and massive-bedded silty shale.
	Lower Mississippian	Burgoon Sandstone	240	Light-gray, very fine to medium-grained, well-sorted, medium- to thick-bedded, crossbedded sandstone (conglomeratic in upper part), and lesser amounts of light-olive-gray, very fine to fine-grained, medium- to thin-bedded, micaceous, silty sub-graywacke.
Mississippian and Devonian	Lower Mississippian and Upper Devonian	Huntley Mountain Formation	570	Light-olive-gray to medium-gray, fine- and very fine grained, thin- to thick-bedded, locally crossbedded sandstone and minor interbedded light-olive-gray, fissile, locally fossiliferous shale.

Table 1. *(Continued)*

System	Series	Formation	Thickness (feet)	Character
Devonian	Upper Devonian	Catskill Formation	1,910–2,020	Upper 560 feet is interbedded red and gray sandstone, red siltstone, and red mudstone, arranged in thick cycles, each becoming finer grained upward. Sandstone is fine and very fine grained, silty, poorly sorted, and micaceous and usually occupies erosional channels. Sandstone is medium to thick bedded, crossbedded in lower part of cycles, and planar bedded above. Siltstone is thin to thick bedded and commonly rippled, and mudstone is generally massive. Middle 1,200 feet is interbedded grayish-red mudstone and siltstone and reddish-gray and light-olive-gray sandstone, and contains only a few cycles. Lower 150 to 230 feet is a cyclic alternation of olive-gray sandstone and shale with grayish-red siltstone, mudstone, and shale. Olive-gray beds and red mudstones are fossiliferous in many places.
		Trimmers Rock Formation: Lock Haven Formation	3,900 ±	Interbedded light-olive-gray, very fine grained, fossiliferous, locally hematitic sandstone, light-gray siltstone, and gray silty shale. Sandstone is lenticular and locally crossbedded. A few conglomerate beds are present near top.
		Trimmers Rock Formation: Brallier Formation	1,800	Interbedded light-gray, thin- to medium-bedded, fossiliferous siliceous siltstone and light-olive-gray, fossiliferous, hard, fissile silty shale.
		Harrell Formation	100	Sooty-black, extremely fissile, massive-bedded shale.
Devonian	Middle Devonian	Mahantango Formation	1,650–1,700	Upper 200 to 250 feet is interbedded gray limestone and shale in upper part and predominantly shale in lower part. The limestone is medium to dark gray, thin to medium bedded, locally fossiliferous, shaly, and silty. The shale is dark gray, calcare-

				ous, silty, and fissile. The upper part of the formation is known as the Tully Member. The lower 1,450 feet of the formation is dark- to very dark gray, silty shale, which weathers to light olive gray.
		Marcellus Formation	360	Sooty-black, massive-bedded, laminated shale.
		Onondaga Formation	80	Upper part is gray, thin- to thick-bedded, fossiliferous, very fine to coarse-grained limestone. Lower part is medium-dark- to dark-gray, thick- to massive-bedded, fissile, fossiliferous shale.
	Lower Devonian	Old Port Formation	325	Upper 80 to 100 feet is white to gray, medium- to coarse-grained, medium- to thick-bedded, crossbedded, fossiliferous, highly porous and friable sandstone known as Ridgeley Member. Medial interval of formation is shale, dark-gray, laminated, and calcareous. Lower and predominant part of formation is limestone, medium- to medium-dark-gray, thin- to thick-bedded, fossiliferous; locally shaly, containing lenses and thin beds of black chert.
Devonian and Silurian	Lower Devonian and Upper Silurian	Keyser Formation	100	Gray, fossiliferous, thin- to medium-bedded limestone. Lower part is nodular and has cobbly weathering; upper part is laminated, argillaceous, and dolomitic.
Silurian	Upper Silurian	Tonoloway Formation	450	Gray, thin- to medium-bedded, laminated, platy, fine-grained limestone.
		Wills Creek Formation	800	Gray (weathers light olive gray), laminated to very thin bedded, calcareous shale and siltstone containing interbeds of gray, thin- to medium-bedded, crossbedded siltstone, dolomite, and gray, thin-bedded limestone.
		Bloomsburg Formation	660	Dominantly grayish-red, thick- to massive-bedded silty claystone containing minor interbeds of olive-gray, very thin bedded silty claystone. Middle part, consisting of gray, fossiliferous, fine-grained limestone, is overlain by olive-gray, laminated calcareous shale.

Table 1. *(Continued)*

System	Series	Formation	Thickness (feet)	Character
	Middle Silurian	Mifflintown Formation	200	Gray, very thin to thick-bedded, fine-grained limestone. Scattered beds of grayish-red claystone near top.
		Rose Hill Formation	950	Dark-gray (weathers to light olive gray), thin-bedded, laminated silty shale and some interbeds of thin-bedded siltstone.
	Lower Silurian	Tuscarora Formation	100–330	Gray to white, medium- to thick-bedded, crossbedded, fine- to coarse-grained quartzite and minor interbeds of light-olive-gray, thin-bedded siltstone and silty shale.
Ordovician	Upper Ordovician	Juniata Formation	1,150	Lower member is grayish-red, thin- to very thick bedded, cross-bedded, fine-grained sandstone, siltstone, and shale. Upper member is coarser grained and has lesser amounts of siltstone and shale.
	Upper Ordovician	Bald Eagle Formation	750	Gray- to greenish-gray, medium- to thick-bedded and cross-bedded, very fine to medium-grained quartzose sandstone. Minor interbeds of gray to grayish-red, thin- to medium-bedded siltstone and shaly siltstone. Medial part of formation is conglomeratic.
		Reedsville Formation	900	Gray to olive-gray, thin- to medium-bedded, silty shale and shaly siltstone. Minor interbeds of olive-gray siltstone and very fine grained sandstone. Lenses and thin beds of densely fossiliferous (brachiopods and crinoid columns) siltstone.
	Middle Ordovician	Antes Formation	330	Gray to black, fissile calcareous shale. Some interbeds of gray, medium- to thick-bedded, fine- to coarse-grained limestone.
		Coburn Formation	300	Gray, medium- to thick-bedded, fossiliferous, coarse-grained limestone. Interbeds of nonfossiliferous, fine- to coarse-grained limestone.
		Salona Formation	200	Gray, thin- to medium-bedded, fine-grained limestone.

	Rodman Formation	65	Gray, thin- to thick-bedded, densely fossiliferous (crinoidal, bryozoan), coarse-grained limestone. Minor interbeds of nonfossiliferous, fine-grained limestone.
	Linden Hall Formation	160	Gray, medium- to thick-bedded, very fine grained, pure limestone. Lower part contains buff-colored dolomite tubes.
Middle Ordovician	Snyder Formation	220	Gray, interlayered, very thin to massive-bedded, very fine to medium-grained limestone, magnesian limestone, and dolomite. Interbeds of fossil-hash limestone.
	Hatter Formation	160–220	Gray, medium- to thick-bedded, fine-grained dolomite and limestone.
Lower Ordovician	Loysburg Formation	250	Gray, thin- to thick-bedded, laminated to very thin bedded, fine-grained magnesian limestone. Interbeds of vuggy and distinctively color banded, very light gray and medium-gray limestone and magnesian limestone.
	Bellefonte Formation	160 exposed	Gray (weathers to buff), medium- to thick-bedded, very fine to fine-grained dolomite. Minor interbeds of dark-gray, medium-bedded, mottled, fine-grained limestone.

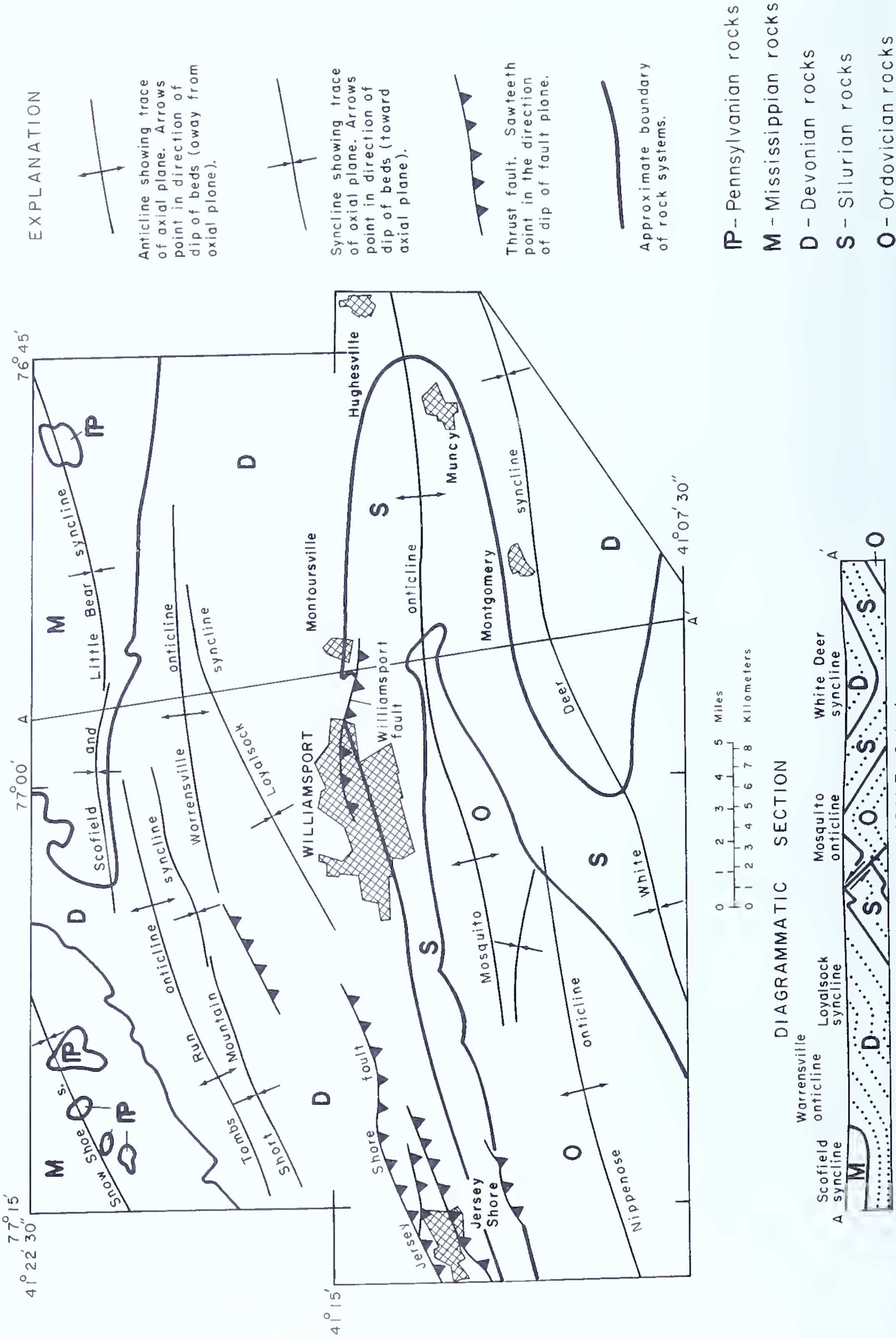

Figure 2. Major geologic structures and rock systems in the Williamsport region.

synclines, and the Jersey Shore and Williamsport thrust faults. By comparison, the geologic structures in the Mississippian and Pennsylvanian rocks are subtle, and the rocks are only slightly deformed.

Quaternary deposits are the youngest and are largely derived from the older rocks on which they were deposited, either by the continental ice sheet, by streams during and after glaciation, or by mass wasting during glaciation. The unconsolidated materials range from huge boulders to clay. Many of these deposits are poorly sorted (till) or very fine grained (glacial-lake clay and silt). However, much of the material that fills the stream valleys is fairly well sorted glacial-outwash deposits of sand and gravel. Colluvium and talus may be found near the base of the steep mountain slopes. Recent alluvial deposits of fine sand, silt, and clay occur on the floodplains. The areal distribution of these materials is shown on maps in the references cited in the first paragraph of this section.

GROUNDWATER RESOURCES

OCCURRENCE AND MOVEMENT

Recharge water infiltrates the soil and percolates downward to the water table. The general shape and altitude of the water table are shown in Figure 3. In most of the area the water table lies in the unconsolidated deposits and weathered bedrock, and groundwater moves through spaces between the rock particles rather than along fractures and solution openings, as it does at greater depths.

Water moves through rocks in response to gravity—from places of high head to low. In general, highest head corresponds to the highest areas, such as the hills of the Appalachian Plateaus province in the northern part of the study area, and along Bald Eagle Mountain and North White Deer Ridge in the central and southern parts. Here the highest heads may be more than 2,000 feet above sea level. The lowest are along the streams and are less than 500 feet above sea level along the West Branch of the Susquehanna River in the south. Thus, groundwater flows away from the ridges and hilltops toward the streams. The streams serve as drains for the groundwater reservoir. The general direction of groundwater movement is also shown in Figure 3.

Heads decrease beneath hills as depth increases, an indication of a potential for downward flow beneath hills. Thus, in wells drilled 100 to 200 feet deep on hilltops, water levels range from less than 50 to 150 feet below land surface; but, in nearby wells drilled 300 to 500 feet deep, levels may range from 150 to 300 feet below land surface.

In the major valley bottoms, heads generally increase with increasing depth, indicating a potential for upward flow. Most flowing wells occur in

Figure 3. General altitude of the water table and general direction of groundwater movement.

valleys. The highest head reported, about 60 feet above land surface, was in well Ly-302 in Muncy, near the confluence of Muncy Creek and the West Branch of the Susquehanna River.

DEPTH OF FRESHWATER CIRCULATION

Fresh water may circulate to depths of 500 feet or more beneath the highest hills. However, only small amounts of fresh water circulate deeper than about 350 feet beneath the valleys. Brackish water, extremely hard calcium sulfate water, and water containing excessive amounts of hydrogen sulfide may be found in some wells drilled in valleys. The median depth of the valley wells that yield these poor-quality waters is 275 feet.

The shallowest brackish water (chloride, 1,300 mg/L [milligrams per liter]; sodium, 770 mg/L) was found near Antes Creek in well Ly-263. Measurements indicated that it was coming from a zone about 115 feet below land surface. About 2.5 miles north of the study area, brackish water (chloride, 2,800 mg/L) was found near Wallis Run in well Ly-262. The brackish water was coming from a zone about 90 feet below land surface.

The shallowest depth at which hydrogen sulfide was found was in a well 50 feet deep (Ly-44) in the valley of Daugherty Run 3 miles west of Williamsport. The shallowest depth at which excessive concentrations of calcium sulfate were found was in well Ly-302. This well is 135 feet deep and is at Muncy, on the floodplain of the West Branch of the Susquehanna River.

All of the groundwater and surface water in the area flows to the West Branch of the Susquehanna River, the master drain. Water in the upper part of the zone of saturation generally moves to the nearest stream and then flows to the West Branch. That in the lower part of the zone moves over a longer flow path to discharge to a stream—not necessarily to the same stream as the water from the upper zone. Water from the lower zone passes beneath smaller streams and is discharged to larger streams or directly to the West Branch. Indeed, two or three such circulation systems may be found with depth at most places. (For a general discussion of groundwater circulation systems, see Toth, 1963; for a discussion of those systems in Pennsylvania, see Carswell and Bennett, 1963).

Measurements of the quality of groundwater discharged to streams and pumped from wells suggest that most groundwater recharge is circulated through the shallow part of the zone of saturation. Figure 4 shows the distribution of specific conductance (an indirect measure of dissolved solids) of groundwater discharge in small streams and is based on measurements made from October 24 to November 19, 1974, a time of low base flow. Only data from very small streams were used and the quality of their flow was assumed to represent the quality of the groundwater discharged from the rocks in these basins. The median specific conductance of water from wells drilled in a particular zone in Figure 4 was compared to the conductance of

streams in that zone. Similar comparisons were made for all the major zones. The median depth of the wells was about 150 feet. The specific conductance of the well water ranged from 1.5 to 2.2 times that of the streams, indicating the groundwater tapped by the wells has larger concentrations of dissolved solids than the groundwater discharged to the streams. All other factors being equal, the dissolved-solids concentration in groundwater is directly proportional to groundwater residence time and the length of the flow path through the rocks (the groundwater reservoir). In general, the deeper the groundwater is circulated through the rocks, the longer the residence time and the flow path, and the higher the dissolved-solids concentration and the specific conductance. Therefore, barring the addition of dissolved solids to the well waters by any kind of contamination, and the loss of dissolved solids from the groundwater discharged to the streams by any kind of chemical change, these data indicate that most (perhaps 75 percent or more) of the groundwater discharged to the streams is circulated to depths shallower than 150 feet (the median depth of the wells) below land surface.

AQUIFERS

An aquifer is a formation, group of formations, or part of a formation that contains sufficient saturated permeable material to yield significant quantities of water to wells or springs. Nearly all formations in the area may be considered aquifers because, in general, they will yield at least domestic supplies of water to wells. The thickness and general character of the formations are presented in Table 1. The areal distribution and geologic and hydrologic characteristics of each formation are shown on Plate 1. Where possible, many of the formations are grouped for convenience of discussion. Data on selected wells and springs in these formations are given in Tables 10 and 11, respectively. Types of geophysical logs on file in the Pennsylvania district office of the U. S. Geological Survey and their well numbers are listed in Table 14.

Estimates of the chemical character of the water were made by measuring pH, hardness, and specific conductance in the field, and by analysis for individual constituents in the laboratory. Specific conductance, an electrical property of the water, can be used to estimate the water's dissolved-solids concentration. The factor by which the conductance can be multiplied to estimate the dissolved-solids concentration was obtained for each aquifer by comparing the conductance with measurements of solids made in the laboratory. Values of the major constituents are presented in Table 12 and those of trace elements in Table 13. Tables of values summarized by aquifer are placed near the discussion of that aquifer.

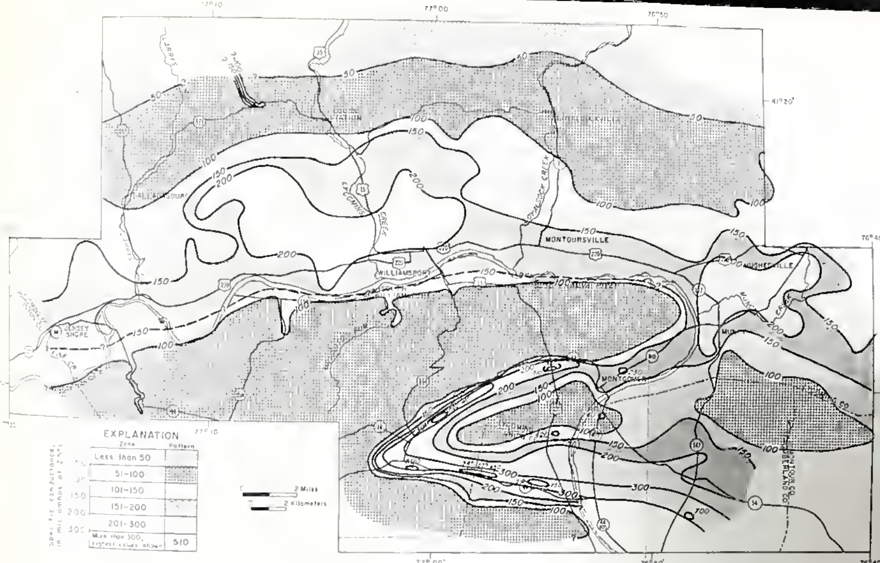

Figure 4 Zones of specific conductance of groundwater discharge from the upper 50 feet of surficial material into small streams. Zones were estimated from measurements made between October 24 and November 19, 1974. The higher the level of specific conductance, the greater the amount of dissolved mineral matter.

Ordovician Age Aquifers

The Ordovician aquifers are grouped by lithology into carbonate rocks, sandstone, and shale. Well characteristics are summarized in Table 2 and analyses in Table 3.

Carbonate Rocks

The carbonate aquifers are the Bellefonte, Loysburg, Hatter, Snyder, Linden Hall, Rodman, Salona, and Coburn Formations and directly underlie about 16 square miles in the central and lower part of the Antes Creek basin in the southwest corner.

Water-Bearing Characteristics. Measurements of water levels in wells indicate a highly permeable system of conduits has developed in these carbonate rocks. Recharge in the Antes Creek basin is routed toward and through this system to Nippeno Spring (Ly-Sp-1 in Table 11). Acidic water having a low dissolved-solids content drains into mountain streams from the noncarbonate rocks and flows into fractures in the carbonate rocks through sinkholes and permeable streambeds. This water establishes and maintains flow paths through the fractures in the carbonates that offer the least resistance as it moves down gradient to Nippeno Spring. Because of its acid nature and large volume, the water has enlarged these fractures by solution to form some of the most permeable aquifers in the area. This permeability allows rapid draining and, thus, the lowest heads in the basin. The potentiometric surface for this drainage system is shown in Figure 5.

Well-depth and water-level data suggest the conduit system is best developed in the vertical direction down to altitudes of about 550 to 600 feet above sea level near Nippeno Spring and to about 650 to 700 feet near the up-basin boundary of the carbonate rocks. In the lateral direction, the conduit-drainage system is best developed along lines of sinkholes that lead directly toward Nippeno Spring. An example is the east-west line of sinkholes that have developed in the Snyder Formation in the northern part of the basin (Plate 1 and Figure 5). Wells drilled into rocks near or in this drainage system and near the up-basin boundary of the carbonate rocks may have water levels deeper than 200 feet below land surface (Ly-265, Table 10). Water levels deeper than 100 feet are quite common.

Between and, in some cases, above the conduits are blocks of carbonate rock that are drained by less well developed fractures, which transmit groundwater much more slowly. Precipitation that infiltrates these blocks moves very slowly toward the lower water-level heads in the conduit-drainage system. Shallow wells completed in these less permeable rocks may have water levels less than 30 feet below land surface.

Table 2. *Summary of Characteristics of Wells in the Ordovician Aquifers*

Formation or aquifer	Percent areal distribution	Reported well depth (feet)			Reported casing depth (feet)			Water level (feet below land surface)			One-hour specific capacity (gallons per minute per foot of drawdown)			Reported yield (gallons per minute)		
		Number of wells	Range of values	Median value	Number of wells	Range of values	Median value	Number of wells	Range of values	Median value	Number of wells	Range of values	Median value	Number of wells	Range of values	Median value
Carbonate rocks	2.6															
Domestic wells		23	35–425	195	19	23–235	100	23	17–210	110	17	0.03–6.3	0.17	20	3–60	6.5
Nondomestic wells		2	115–205	160	1	—	32	2	25–139	95	2	1.4–43.4	22	2	8–59	34
Sandstone	8.6															
Domestic wells		13	48–400	160	12	20–100	28	13	Flow–230	55	11	.01–.5	.14	12	2–30	13.5
Nondomestic wells		1	—	57	1	—	50	1	—	31	0	—	—	0	—	—
Shale	3.5															
Domestic wells		17	12–360	140	15	12–108	41	16	0–185	33	11	.04–1.4	.11	14	1–100	10.5
Nondomestic wells		0	—	—	0	—	—	0	—	—	0	—	—	0	—	—

Table 3. *Summary of Chemical Analyses of Water from Wells in the Ordovician Aquifers*

	LABORATORY RESULTS, IN MILLIGRAMS PER LITER																FIELD			
	Silica (SiO_2)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3) as N	Orthophosphate (PO_4) as P	Dissolved solids (residue on evaporation at 180°C)	Hardness as $CaCO_3$	Alkalinity as $CaCO_3$	pH	Specific conductance (micromhos at 25°C)	Hardness, as $CaCO_3$ (grains per gallon)	Temperature (degrees Celsius)
									CARBONATE ROCKS											
Number of samples	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	9	10	10	10
Range of values	3.6-10	.0-.03	.0-.01	31-170	6.1-110	2.1-3.6	1.0-1.9	96-320	18-680	2.1-16	.2-.3	.3-9.9	0.-.01	139-1120	102-877	79-262	6.5-8.0	200-1410	6-51	10.5-13
Median value	7	.02	.0	66	24	2.9	1.4	260	25	5.5	.2	2.1	.0	339	284	213	7.2	575	20	11.2
									SANDSTONE											
Number of samples	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	5	4	5	3
Range of values	2.6-4.8	0-4.5	.01-.04	1.2-2.3	1.2-1.7	.1-3.1	.4-.7	15-23	.0-.0	.1-5.5	.0-.1	.0-.52	.01-.01	31-42	8-13	12-19	5.5-6.5	55-80	1-4	8-12
Median value	3.7	2.3	.03	1.8	1.5	1.6	.55	19	.0	2.8	.05	.26	.1	37	10.5	16	6.0	62	1	9
									SHALE											
Number of samples	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	7	7	7	4
Range of values	7.9-12	.0-.09	.0-.0	18-44	1.6-15	1.3-41	.4-1.9	103-227	4.8-11	.8-33	.1-.7	.05-3.1	.0-.05	110-259	71-137	84-186	5.5-7.5	200-440	1-11	11-12.5
Median value	10	.01	.0	30	6.2	10	1.3	116	5.1	2.5	.1	.53	.01	142	120	95	7.0	230	7	12.2

In general, the closer any well is drilled to rocks that are drained rapidly by the conduits, the deeper the water level will be in that well. A shallow well, about 50 feet deep and having a 30-foot water level, may be drilled near a 350-foot-deep well that has a water level 200 feet below land surface if the deeper well is closer to the conduits. Shallow wells may also be drained wherever deep wells connect the shallow water-bearing zones with the deep zones.

A distance-drawdown analysis of the potentiometric surface shown in Figure 5 indicates the average transmissivity of the carbonate rocks in the conduit-drainage system is about 11,500 ft²/d (square feet per day). Steady-

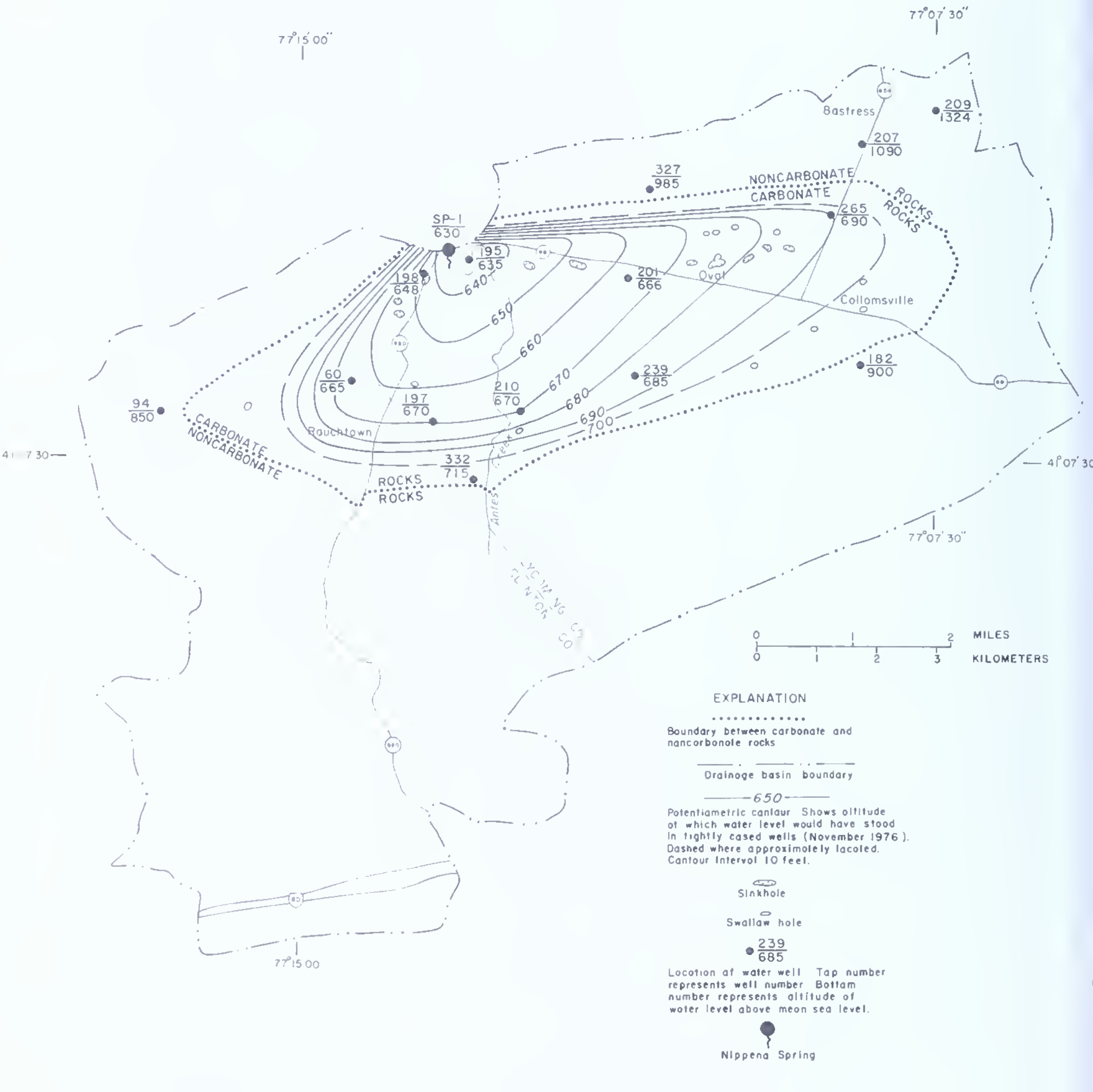

Figure 5. Potentiometric surface for the highly permeable carbonate drainage system in the Antes Creek basin.

state conditions were assumed and 52 Mgal/d (million gallons per day) was taken as the average discharge of Nippeno Spring. A time-drawdown analysis of a 10-hour pumping test on well Ly-202 yielded a comparable transmissivity value of about 10,000 ft^2/d. The pumping rate was 59 gal/min (gallons per minute), and the specific capacity of this well was about 43 (gal/min)/ft (gallons per minute per foot) after pumping 1 hour and 35 (gal/min)/ft after pumping 10 hours. The well was drilled in the Hatter Formation 0.3 mile south-southeast of Nippeno Spring. The well is 8 inches in diameter and 115 feet deep and penetrates a large solution opening about 100 feet below land surface.

The average well drilled in these carbonate rocks does not tap large solution openings directly, of course, and therefore yields much less water than well Ly-202. The median specific capacity of 25 wells, based on 1-hour tests, is only 0.17 (gal/min)/ft. Other parameters are summarized in Table 2.

A properly located and constructed well can probably produce at least 100 gal/min if drilled near the up-basin boundary of the carbonates and 500 gal/min or more near Nippeno Spring. The proper location is critical, as the solution openings in the conduit-drainage system, although very large compared to the rest of the fractures in these rocks, constitute only a very small volume of the carbonates. Thus, one or more exploratory wells may be required to locate the large openings. Wells drilled for high yield near the up-basin boundary of the carbonates should be near a stream and the sinkhole it flows into, whereas those closer to Nippeno Spring should be drilled along a line of sinkholes that lead toward the spring. They should be drilled to depths at least 50 feet below the altitude of the potentiometric surface shown for that location in Figure 5.

Water-Quality Characteristics. Field measurements of pH, total hardness, and specific conductance indicate that water from wells drilled in the Ordovician age carbonate aquifers ranges from slightly acid to alkaline, from hard to extremely hard, and from moderate to excessive in dissolved-solids concentration. The concentration of dissolved solids can be estimated by multiplying the specific conductance by 0.60.

Median values from laboratory analyses indicate that the water type is generally calcium bicarbonate. However, the water from well Ly-201 is calcium-magnesium sulfate and has excessive hardness (877 mg/L) and dissolved solids (1,120 mg/L). Both the dissolved-solids and the sulfate concentrations exceed the amounts recommended by the U. S. Environmental Protection Agency (EPA) in their national secondary drinking water regulations (U. S. Environmental Protection Agency, 1977). The concentration of nitrate in water from well Ly-199 is only 0.1 mg/L less than the maximum recommended by EPA in their national interim primary drinking water regulations (U. S. Environmental Protection Agency, 1975). The well is in a barnyard and the water may be contaminated by animal wastes.

Water from Ly-202 had the lowest dissolved-solids concentration (139 mg/L) of any water sampled from the carbonates. The well gets its water directly from the conduit-drainage system, where the water moves very rapidly and, therefore, has limited opportunity to dissolve the carbonate rock.

Sandstone

The sandstone aquifers consist of the Bald Eagle and Juniata Formations. The Bald Eagle Formation directly underlies about 28 square miles on the flanks of the Antes Creek basin and Mosquito Valley, from the southwestern to the south-central part of the area. The Juniata Formation directly underlies about 12 square miles and is confined to a narrow band that completely surrounds the Bald Eagle Formation.

Water-Bearing Characteristics. No high-yield wells were found, and of the 12 wells inventoried (all domestic), yields range from 2 to 30 gal/min and the median is 14 gal/min. Specific capacities after 1 hour range from 0.01 to 0.50 (gal/min)/ft and the median is 0.14 (gal/min)/ft. As much as 100 gal/min, however, might be obtained from wells in draws and valley bottoms. Water levels as deep as 230 feet below land surface were found in a high ridge overlooking Mosquito Valley (well Ly-352). Flowing wells are present in draws and small creek bottoms if only shallow water-bearing zones are penetrated by the well. The median water level was 55 feet below land surface.

Water-Quality Characteristics. Water from these sandstone aquifers is acidic, soft, and contains minute concentrations of dissolved solids. In general, these waters are corrosive to metal plumbing. The dissolved-solids concentration can be estimated by multiplying the specific conductance of the water by 0.55.

Medians of the laboratory analyses indicate that these waters are of the magnesium-calcium bicarbonate type. Water from well Ly-196 has concentrations of iron and zinc that exceed those recommended by EPA in their national secondary drinking water regulations (U. S. Environmental Protection Agency, 1977). Excessive iron concentration is a common problem in water from these rocks. Water from the Ordovician sandstone has the lowest concentration of dissolved solids of any water analyzed.

Shale

The shale aquifers include the Antes and Reedsville Formations and directly underlie about 16 square miles in the southwest. They rim the Ordovician carbonate rocks in the Antes Creek basin and underlie the central part of Mosquito Valley and the upper part of Bender Run.

Water-Bearing Characteristics. The shale generally yields adequate amounts of water for domestic supplies. Although no wells have been drilled to ob-

tain moderate to large supplies of water from these rocks, a reported yield of 100 gal/min from a domestic well suggests that this much water might be available from some wells.

Water-Quality Characteristics. Field measurements of pH, total hardness, and specific conductance indicate that the water ranges from acidic to alkaline and from moderately hard to hard, and that it has moderate concentrations of dissolved solids. Dissolved-solids concentrations can be estimated by multiplying the specific conductance of the water by 0.60.

Medians of the laboratory analyses indicate that the water is calcium bicarbonate in type. All constituents analyzed were lower in concentration than the maximum levels recommended by EPA in their drinking water regulations (U. S. Environmental Protection Agency, 1977).

Objectionable amounts of hydrogen sulfide were found in water from wells Ly-182 and -213, which were drilled 250 and 220 feet deep, in the Antes Formation on the southern flanks of the Antes Creek basin. The amount of hydrogen sulfide in water from both wells increases with the length of continuous pumping.

Silurian Age Aquifers

Characteristics of wells completed in the Silurian age aquifers are summarized by lithology in Table 4 and by chemical analyses of their water in Table 5.

Carbonate Rocks

The carbonate aquifers are the Mifflintown and Tonoloway Formations, which directly underlie about 15 square miles. The Mifflintown underlies about 5 square miles and is separated from the Tonoloway by the Bloomsburg and Wills Creek Formations.

Water-Bearing Characteristics. Specific-capacity data indicate that carefully located and constructed wells should yield 200 gal/min or more. Wells in the Tonoloway Formation produced about ten times as much water as those in the Mifflintown Formation. However, the sides of wells drilled in the Tonoloway Formation tend to cave badly, and large amounts of casing may be needed to prevent the wells from filling with the caved material.

Transmissivity values from pumping tests on four wells in the Tonoloway Formation range from 370 to 2,770 ft^2/d. The tests were 8 to 24 hours long.

Water-Quality Characteristics. Chemical-quality data are available only for the Tonoloway Formation. The field data indicate that water from the deeper wells is more alkaline, harder, and higher in dissolved solids. For example, water from domestic wells (median depth, 123 feet) had a median pH of 7.0, a hardness of 11 gpg (grains per gallon), and a conductance of

Table 4. *Summary of Characteristics of Wells in the Silurian Aquifers*

Formation or aquifer	Percent areal distribution	Reported well depth (feet)			Reported casing depth (feet)			Water level (feet below land surface)			One-hour specific capacity (gallons per minute per foot of drawdown)			Reported yield (gallons per minute)		
		Number of wells	Range of values	Median value	Number of wells	Range of values	Median value	Number of wells	Range of values	Median value	Number of wells	Range of values	Median value	Number of wells	Range of values	Median value
Carbonate rocks	3.1															
Domestic wells		23	52–409	123	19	27–169	71	21	16–124	45	18	0.06–7.3	0.76	20	8–45	21
Nondomestic wells		14	75–699	214	10	40–208	89	13	2–120	45	8	.73–25.6	7.1	12	50–323	110
Sandstone	4.2															
Domestic wells		0	—	—	0	—	—	0	—	—	0	—	—	0	—	—
Nondomestic wells		0	—	—	0	—	—	0	—	—	0	—	—	0	—	—
Shale	8.8															
Domestic wells		41	40–415	113	38	20–161	43	34	Flow–100	25	19	.04–3.0	.38	36	3–150	17
Nondomestic wells		11	96–500	145	9	20–80	40	7	7–25	25	5	.93–9.8	4.5	9	25–166	60

Table 5. *Summary of Chemical Analyses of Water from Wells in the Silurian Aquifers*

	LABORATORY RESULTS, IN MILLIGRAMS PER LITER																FIELD			
	Silica (SiO_2)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3) as N	Orthophosphate (PO_4) as P	Dissolved solids (residue on evaporation at 180°C)	Hardness as $CaCO_3$	Alkalinity as $CaCO_3$	pH	Specific conductance (micromhos at 25°C)	Hardness, as $CaCO_3$ (grains per gallon)	Temperature (degrees Celsius)
CARBONATE ROCKS																				
Number of samples	2	10	9	5	5	4	2	2	9	9	8	4	2	6	9	9	12	15	12	12
Range of values	5.9–6.5	.02–5.5	.0–.1	17–360	3.2–115	1.1–33	.5–.8	44–264	8–1950	1.6–69	.0–.4	.04–4	.0–.01	264–2570	56–1450	36–220	6.5–8.0	250–2500	8–87	10–13.5
Median value	6.2	.13	.0	110	33	7.1	.7	154	149	15	.05	3.0	.01	569	430	142	7.0	500	12	12
SHALE																				
Number of samples	3	4	4	3	3	3	3	3	4	4	4	3	3	4	4	4	9	10	12	10
Range of values	6.7–8.6	.1–.25	.0–.07	15–130	4.2–56	4.3–770	1.3–16	75–206	2.9–480	4.2–1300	.0–1.8	.01–.02	.01–.01	107–2430	55–560	12–169	5.8–8.1	140–4100	4–32	11–12.5
Median value	8.0	.18	.03	68	8.6	7.4	1.3	107	19	8.7	.1	.01	.01	452	145	75	7.0	210	6.5	11.6

330 micromhos, whereas water from nondomestic wells (median depth, 214 feet) had a median pH of 7.5, a hardness of 16 gpg, and a conductance of 850 micromhos.

Medians of the chemical analyses indicate the water is calcium sulfate in type. Extreme calcium sulfate hardness and objectionable amounts of hydrogen sulfide were found in water from deep wells in valley bottoms, particularly in the valley of the West Branch of the Susquehanna River. Packer tests in some of these wells indicate that the poor-quality water in the deep water-bearing zones has a higher head than water in the shallow zones, so that the poor-quality water flows up the borehole and into the shallow zones. Wells Un-71 and -72 are excellent examples. Less mineralized water was found in wells in this formation where it occurs at higher altitudes.

Excessive concentrations of iron were found in water from wells Un-71, Ly-250, and Ly-283, and of manganese in water from well Ly-283. Sulfate and dissolved solids exceeded EPA standards in water from wells Un-71 and -72 and Ly-287 and -288, and dissolved solids exceeded EPA standards in the water from well Ly-283.

Sandstone

Silurian sandstone aquifers are represented solely by the Tuscarora Formation, which is composed principally of hard, erosion-resistant sandstone and quartzite. These rocks directly underlie about 19 square miles and form North White Deer Ridge and Bald Eagle Mountain. Generally the areas underlain by this formation are in state forests or on steep, talus-covered slopes, and are uninhabited. Consequently, data are insufficient to evaluate the water-bearing and water-quality characteristics of these rocks. However, some inferences can be drawn, based on the lithology and topographic position of the formation. Wells will probably yield only moderate to small amounts of acidic water; deep wells will have very deep water levels; and drilling deeper than 150 to 200 feet below land surface will not yield more water. Drilling should be started at the lowest elevation possible.

Shale

The shale aquifers are the Rose Hill, Bloomsburg, and Wills Creek Formations. These rocks directly underlie about 41 square miles in the valley of the West Branch of the Susquehanna River, along the base of the north slope of Bald Eagle Mountain, and along the base of the south slope of North White Deer Ridge.

Water-Bearing Characteristics. The largest yields are obtained from the Bloomsburg Formation and the smallest from the Rose Hill Formation. The median yield of four wells drilled for public supply or industrial use in the Bloomsburg Formation is 120 gal/min, or eight times that of the domestic

wells; the median specific capacity of the four wells is 6.5 (gal/min)/ft, or 17 times that of the domestic wells. The data indicate that yields of several hundred gallons per minute should be obtainable from wells that are carefully located and constructed.

The Rose Hill Formation is the least likely to yield large supplies of water to wells. The lower water-transmitting capacity of this formation is shown not only by low well yields and specific capacities, but is suggested by the springs that emerge near the contact between the overlying Tuscarora and the Rose Hill. Water moving down-gradient through the Tuscarora Formation and the talus and colluvium that overlie this formation rises to the surface as spring flow when it comes in contact with the less permeable Rose Hill Formation.

Water-Quality Characteristics. Field measurements of pH, hardness, and specific conductance indicate that the quality of water from these rocks can be extremely variable. The field pH ranged from 5.8 to 8.1 and was generally below 7.0 (acidic) in water from the Bloomsburg and Wills Creek Formations and above 7.0 (alkaline) in water from the Rose Hill Formation. Hardness ranged from 4 to 32 gpg. The extremely hard waters were found in the Wills Creek Formation and came from the deepest wells (150 to 300 feet deep). Water from the other shale units was usually only moderately hard (averaging 5 gpg). Specific conductance ranged from 140 to 4,100 micromhos and was most variable in water from the Wills Creek and Rose Hill Formations. Although the median conductance of water from both formations is about 150 micromhos, a sample from the Wills Creek had a conductance of about 1,080 micromhos (due chiefly to calcium sulfate) and one from the Rose Hill had a conductance of 4,100 micromhos (due to sodium chloride).

Samples from four wells contained concentrations of constituents that exceed the recommended limits of the EPA (U. S. Environmental Protection Agency, 1977). Water from well Ly-263 had excessive concentrations of barium, chloride, and dissolved solids. The barium was 2.6 times the maximum contaminant limit. Well Ly-251 contained excessive concentrations of cadmium and manganese and had an odor of hydrogen sulfide. The cadmium was 3.4 times the recommended maximum contaminant limit. Well Ly-282 had excessive concentrations of lead. Finally, excessive concentrations of sulfate and dissolved solids were found in water from well Ly-302.

Silurian and Devonian Age Aquifer

Carbonate Rocks

The Keyser Formation is the only unit that extends across the boundary between the Silurian and Devonian Periods. It directly underlies slightly

more than 3 square miles and is confined to a narrow band in the valley of the West Branch of the Susquehanna River in the vicinity of Bald Eagle Mountain and in White Deer Valley. Well characteristics are summarized in Table 6 and chemical analyses in Table 7.

Water-Bearing Characteristics. Moderate to large supplies of groundwater are available from this formation. The median yield of six wells drilled for industrial purposes is 238 gal/min, and their median 1-hour specific capacity is 8.5 (gal/min)/ft. The wells have a median depth of 363 feet. Analysis of a 48-hour pumping test on well Un-75 shows a transmissivity of 460 ft^2/d.

Water-Quality Characteristics. Seven laboratory analyses were used for the water-quality evaluation. Concentrations of iron in excess of those recommended by EPA (U. S. Environmental Protection Agency, 1977) were found in water from wells Un–73 and –75 and Ly–320. Excessive concentrations of sulfate were found in well Un–75, and of dissolved solids in wells Un–73 and –75. The quality of the water in this formation is very similar to that in the Tonoloway Formation. As in the Tonoloway, excessive calcium sulfate hardness and objectionable amounts of hydrogen sulfide were found in deep wells in the valley of the West Branch of the Susquehanna River.

The concentration of nitrate in water from well Ly-320 (10.6 mg/L nitrogen) exceeds the maximum contaminant level recommended by EPA.

Devonian Age Aquifers

Well characteristics of the Old Port Formation are summarized in Table 6 and those of the Devonian shale and siltstone are summarized in Table 8. Chemical characteristics of the water in the Old Port are summarized in Table 7 and those of the water in the Devonian shale and siltstone are summarized in Table 9.

Old Port Formation

The Old Port Formation is dominantly a carbonate rock, except for the upper 100 feet, which is known as the Ridgeley Member and is composed of sandstone. The formation directly underlies about 9 square miles. The sandstone is exposed and quarried just south of Jersey Shore and north of the West Branch of the Susquehanna River between Williamsport and Montoursville. In general, the formation lies in the valley of the West Branch from Jersey Shore to the Muncy-Montgomery area. From there it strikes along the north side of White Deer Valley to Elimsport, and from there along the south side of the valley to Allenwood.

Water-Bearing Characteristics. The Old Port Formation is one of the most productive aquifers in the entire area, particularly the Ridgeley Member.

Table 6. *Summary of Characteristics of Wells in the Keyser and Old Port Formations*

Formation or aquifer	Percent areal distribution	Reported well depth (feet)			Reported casing depth (feet)			Water level (feet below land surface)			One-hour specific capacity (gallons per minute per foot of drawdown)			Reported yield (gallons per minute)		
		Number of wells	Range of values	Median value	Number of wells	Range of values	Median value	Number of wells	Range of values	Median value	Number of wells	Range of values	Median value	Number of wells	Range of values	Median value
Keyser Formation	0.7															
Domestic wells		4	63–84	114	4	34–115	47	4	10–60	43	2	0.4–5.8	3.1	3	8–50	22
Nondomestic wells		6	150–464	363	6	30–192	56	6	Flow 30	10.5	4	3.5–200	8.5	6	17–380	238
Old Port Formation	1.9															
Domestic wells		20	35–330	100	18	24–164	41	17	10–83	40	9	.08–2.9	.53	18	2–150	20
Nondomestic wells		11	126–548	244	9	44–153	69	9	0–86	24	8	1.6–23	8.1	10	85–500	230

Table 7. *Summary of Chemical Analyses of Water from Wells in the Keyser and Old Port Formations*

	Laboratory results, in milligrams per liter: Silica (SiO_2)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3) as N	Orthophosphate (PO_4) as P	Dissolved solids (residue on evaporation at 180°C)	Hardness as $CaCO_3$	Alkalinity as $CaCO_3$	Field: pH	Specific conductance (micromhos at 25°C)	Hardness, as $CaCO_3$ (grains per gallon)	Temperature (degrees Celsius)
KEYSER FORMATION																				
Number of samples	0	6	6	3	3	0	0	0	6	7	6	1	0	7	6	7	2	5	7	2
Range of values	—	.2–3.0	0–.05	70–148	5.8–30	—	—	—	3.7–507	2–102	0–.2	10.6	—	286–1004	236–490	80–248	7.5–7.5	220–1050	6–22	11–12
Median value	—	.52	.0	78	28	—	—	—	115	12.7	.0	—	—	418	319	126	7.5	435	20	11.5
OLD PORT FORMATION																				
Number of samples	5	8	6	9	7	4	4	5	11	10	8	6	4	11	11	8	16	18	17	13
Range of values	5.6–13	0–2.8	0–.08	19.8–290	1.8–100	2.6–290	.3–2.0	46–140	12–1100	1.4–470	0–1.0	.4–1.9	.01–.03	94–2580	57–1419	38–416	6.0–7.5	165–5900	5–67	10–13.5
Median value	9.4	.23	.02	56	11	5.2	.6	86	71	17	.1	.6	.01	340	238	86	7.0	375	7	12

Table 8. *Summary of Characteristics of Wells in the Devonian Shale and Siltstone Aquifers, and Quaternary Valley-Fill Aquifers*

Formation or aquifer	Percent areal distribution	Reported well depth (feet)			Reported casing depth (feet)			Water level (feet below land surface)			One-hour specific capacity (gallons per minute per foot of drawdown)			Reported yield (gallons per minute)		
		Number of wells	Range of values	Median value	Number of wells	Range of values	Median value	Number of wells	Range of values	Median value	Number of wells	Range of values	Median value	Number of wells	Range of values	Median value
Shale	12.1															
Domestic wells		54	50–455	135	46	20–116	47	42	Flow–200	21	30	0.01–2.2	0.20	46	1–42	12
Nondomestic wells		22	46–600	187	18	23–152	56	21	Flow–60	15	16	.01–29	2.2	22	12–355	52
Siltstone	39.7															
Domestic wells		118	30–480	153	106	5–110	26	102	Flow–320	35	69	.04–11.8	.10	108	1–100	6
Nondomestic wells		7	124–560	400	7	15–61	33	7	10–100	22	5	.25–8.8	.37	6	29–200	67
Valley fill	15															
Domestic wells		40	11–102	45	35	21–105	46	33	2–70	12	10	.5–12.5	2.0	18	5–100	24
Nondomestic wells		35	22–126	36	31	15–103	30	32	5–34	10	29	5.9–447	32	35	40–3014	300

Table 9. *Summary of Chemical Analyses of Water from Wells in the Devonian Shales and Siltstones, and the Quaternary Valley-Fill Deposits*

	LABORATORY RESULTS, IN MILLIGRAMS PER LITER																FIELD			
	Silica (SiO_2)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3) as N	Orthophosphate (PO_4) as P	Dissolved solids (residue on evaporation at 180°C)	Hardness as $CaCO_3$	Alkalinity as $CaCO_3$	pH	Specific conductance (micromhos at 25°C)	Hardness, as $CaCO_3$ (grains per gallon)	Temperature (degrees Celsius)
DEVONIAN SHALE																				
Number of samples	6	16	14	11	11	5	4	5	17	17	14	8	4	14	10	15	16	21	22	15
Range of values	9.1-18	.01-10.5	.0-.13	13-124	2.8-40	4.4-6.7	.2-1.4	59-220	0-390	0-282	0-.2	0-2.7	.01-.15	82-282	44-249	48-138	6.0-7.9	80-850	2-15	9-13.5
Median value	12	.3	.01	31	5.9	6.0	.4	98	13	1.0	.0	.03	.02	159	98	87	6.85	215	6	12
DEVONIAN SILTSTONE																				
Number of samples	13	14	14	14	14	12	13	13	15	15	13	14	12	14	15	14	33	35	36	12
Range of values	7.2-18	.03-2.0	.0-.91	5.1-96	1.5-24	3.0-48	.16-1.4	14-122	.1-76	1.3-2800	.0-.39	.0-7.0	.01-.15	59-516	19-457	11-100	5.0-9.25	50-8500	1-18	9.5-13
Median value	12	.13	.03	21	5.3	15	0.7	90	9.5	13	.1	.88	.02	142	72	76	6.9	220	5	11.3
QUATERNARY VALLEY FILL																				
Number of samples	8	33	30	26	11	8	7	7	32	33	18	14	6	29	33	31	17	18	24	10
Range of values	3-7.6	.0-12	.0-.3	6.4-42	1.8-11.9	2.0-6.6	.6-2.0	15-66	.0-53	3-42	.0-.1	.0-4.8	.01-.09	38-292	20-166	8-116	5.0-7.0	50-380	1-10	6.7-18
Median value	5.6	.1	.0	16.4	4.7	3.6	.7	19	30	13	.0	1.4	.03	93	59	26	6.0	180	4.5	12

Yields of 11 wells drilled to obtain large amounts of water range from 85 to 500 gal/min, and the median yield is 230 gal/min. The 1-hour specific capacities of these wells range from 1.6 to 23 (gal/min)/ft, and the median is 8.1 (gal/min)/ft. In places the sandstone member of this formation is extremely friable and caves badly during well-drilling operations. In such places long lengths of casing are needed to prevent the wells from being filled with the caved material.

Four wells finished in the Ridgeley Member have transmissivities ranging from 500 to 1,100 ft^2/d. The tests were from 8 to 48 hours in length.

Water-Quality Characteristics. Field measurements of pH, hardness, and specific conductance indicate that the water is generally neutral and hard and contains moderate concentrations of dissolved solids. Laboratory analyses indicate that the water is a calcium sulfate-bicarbonate type. Excessive concentrations of iron were found in wells Un–77 and Ly–228 and –297, and of manganese in wells Cn–90 and Ly–297. In addition, excessive concentrations of sulfate, chloride, and dissolved solids were found in water from wells Un–76 and –77 and Ly–228. All other constituents were below the maximum concentrations recommended for public water supply by EPA (U. S. Environmental Protection Agency, 1977).

Water from wells less than 300 feet deep generally had only moderate concentrations of dissolved solids, a maximum hardness of 14 gpg, and a specific conductance of less than 500 micromhos. Wells deeper than 300 feet had excessive concentrations of dissolved solids, sulfate, and chloride, and in some cases objectionable amounts of hydrogen sulfide. In the valley of the West Branch of the Susquehanna River, where the Old Port Formation occurs deeper than 300 feet below land surface, it may be filled with poor-quality water, especially where a well intended to produce water from the Ridgeley penetrates the underlying Keyser and Tonoloway. The poor-quality water encountered in these formations may flow up the well and degrade the quality of water in the shallower zones. Excellent examples of this phenomenon are found in wells Un–76 and –78 and Ly–228.

Well Ly–228 was initially drilled 455 feet deep, or about 280 feet below the sandstone member of the Old Port. When the sandstone was found to be the best aquifer to that depth, the well was screened in alternate 5-foot intervals from 138 to 193 feet below land surface. When finished, the well produced 390 gal/min of good-quality water. However, the well was not used for about seven months before the final pump installation and testing were made. When the test was begun on December 4, 1968, the water contained about 1,100 mg/L dissolved solids and about 500 mg/L sulfate. After 26 hours of pumping the water contained 500 mg/L dissolved solids and 160 mg/L sulfate. After another long idle period, the well was retested from March 29 to April 29, 1976. The concentration of sulfate in the water at the beginning of this test was 1,800 mg/L, and at the end of the test it was 320

mg/L. These data suggest that small amounts of poor-quality water (containing large concentrations of sulfate, chloride, dissolved solids, and hydrogen sulfide) flow upward from the deep part of the hole and into the sandstone aquifer. During long idle periods these small amounts become large volumes of poor-quality water within the sandstone aquifer. More than 10 Mgal (million gallons) was apparently transferred in this fashion prior to the March-April 1976 pumping test. When the well was pumped, the poor-quality water was partly removed from the sandstone.

The potential for similar degradation of water quality was measured in deep wells drilled in the Tonoloway, Keyser, and Old Port Formations north of Allenwood. Here poor-quality water was flowing up some of the deep wells and into the shallow water-bearing zones at a rate of about 15 gal/min or about 22,000 gal/d (gallons per day). If this rate has continued in just one well since they were drilled in the early spring of 1974, more than 28 Mgal of poor-quality water has been transferred to the shallow water-bearing zones (as of September 1977).

These kinds of water-quality degradation can be avoided by realizing that the hazard exists and by plugging the lower part of the hole with fine sand or cement when water of poor quality is encountered.

Shale

The Devonian shale aquifers are the Onondaga, Marcellus, Mahantango, and Harrell Formations. They directly underlie about 62 square miles in a band about a mile wide that trends parallel to the base of Bald Eagle Mountain and that broadens to 2 miles off the nose of the mountain in the Hughesville area and to more than 3 miles in the central part of White Deer Valley.

Water-Bearing Characteristics. Moderate supplies of water are generally available from the shale. However, yields range widely, from 12 to 355 gal/min in 22 industrial and public-supply wells; the median is 52 gal/min. The 1-hour specific capacities of these wells range from 0.01 to 29 (gal/min)/ft; the median is 2.2 (gal/min)/ft. The median depth is 187 feet.

Transmissivities of 12 wells in the Mahantango Formation range from 22 to 1,400 ft^2/d, and the median is 52 ft^2/d. A well in the Marcellus Formation has a transmissivity of about 140 ft^2/d. The tests were 1 to 48 hours long and about half of them exceeded 15 hours. All water-level measurements were made in the pumped well.

Water-Quality Characteristics. Field measurements of pH, hardness, and specific conductance indicate that water from the shale is commonly slightly alkaline and moderately hard, and contains only moderate amounts of dissolved solids. The quality of water from domestic and industrial wells is very similar, probably because the depths of the two groups are similar. The

dissolved-solids concentration can be estimated by multiplying the specific conductance by 0.72.

Five complete chemical analyses by the U. S. Geological Survey and a dozen partial analyses by commercial laboratories were used to evaluate the water's quality. The median of the data from chemical analyses indicates that the water is calcium bicarbonate in type.

Excessive concentrations of dissolved iron were found in water from wells Ly–158, –215, –216, –217, –269, and Un–90, and of manganese in water from wells Ly–158 and –266. Sulfate and chloride exceeded EPA standards only in well Ly–269. Objectionable amounts of hydrogen sulfide occur in wells drilled in or near valley bottoms. This is particularly true but not limited to water from deep wells in the Mahantango Formation. All other constituents were less than the concentrations recommended by EPA for public drinking water.

Siltstone

The Devonian siltstone aquifers are the Trimmers Rock, Brallier, Lock Haven, and Catskill Formations. The Trimmers Rock Formation underlies about 24 square miles in the southeast. North and west of Hughesville, rocks that correlate with the Trimmers Rock have been divided into upper and lower units, called the Lock Haven and Brallier Formations, respectively. These two formations underlie about 86 square miles in the north-central part of the area. The Catskill Formation underlies about 74 square miles and commonly occurs between the Lock Haven Formation on the south and the Mississippian and Pennsylvanian rocks on the north. Although sandstone and shale compose parts of these formations, siltstone is the dominant lithology of each and, therefore, they are all included in this category.

Water-Bearing Characteristics. These formations are among the poorest aquifers. The contrast between domestic and nondomestic wells, however, shows that even here adequate supplies can often be obtained where there is sufficient need. The median yield and median specific capacity of domestic wells are 6 gal/min and 0.10 (gal/min)/ft, whereas for nondomestic wells they are 67 gal/min and 0.37 (gal/min)/ft. The median depth of the domestic wells is 153 feet, and that of the nondomestic wells is 400 feet.

The well-yield and 1-hour specific-capacity data for each formation indicate that the wells in the Catskill and Brallier Formations yield about twice as much water as those in the Lock Haven and Trimmers Rock Formations.

Transmissivities of seven wells range from 5 to 845 ft^2/d. The median is 20 ft^2/d. All were determined with short-term tests, which ranged in length from 1 to 3 hours. All observations of water-level drawdown were made in the pumped well.

Water-Quality Characteristics. Field analyses show the water from these rocks to be nearly neutral (median pH, 6.9), soft (median hardness, 5 gpg),

and low in dissolved solids (median specific conductance, 220 micromhos). The dissolved solids of the water from the siltstones can be estimated by multiplying the specific conductance by 0.58. The deeper wells, as exemplified by the nondomestic wells, contained about twice as much dissolved mineral matter as the shallow (domestic) wells. The median specific conductance was 365 micromhos for the nondomestic well water and 190 micromhos for the domestic.

Twelve complete analyses were used to evaluate the water quality. The medians of the analyses indicate that the water is calcium-sodium bicarbonate in type.

Excessive concentrations of iron were found in water from wells Ly–180, –230, –253, –258, and –420, of manganese from wells Ly–112, –166, –180, –230, –258, and –420, and of chloride and dissolved solids from wells Ly–262 and –420. Also, concentrations of lead in water from wells Ly–253 and –258 exceed the maximum contaminant level set by EPA (U. S. Environmental Protection Agency, 1975). All other constituents analyzed were below the maximum concentrations recommended by EPA.

Mississippian-Devonian, Mississippian, and Pennsylvanian Aquifers

The Mississippian-Devonian Huntley Mountain Formation, Mississippian Burgoon Sandstone and Mauch Chunk Formation, and Pennsylvanian Pottsville Formation underlie about 60 square miles of unpopulated, densely wooded land in the north. Well data are insufficient to evaluate the water-bearing and water-quality characteristics of these rocks.

Quaternary Aquifers

Most of the area is blanketed with unconsolidated deposits of Quaternary age. Of these materials, the valley-fill deposits have the greatest potential for the development of high-yield wells, partly because of their coarse character and partly because the streams that traverse these deposits can be a source of recharge to sustain high well yields. Well characteristics are summarized in Table 8 and chemical analyses in Table 9.

Valley-Fill Deposits

These deposits include all the unconsolidated materials that occur in the stream valleys. Their estimated distribution and saturated thickness are shown on Plate 2. These materials underlie about 60 square miles; about 10 percent have a saturated thickness of about 50 feet, 55 percent a saturated thickness of about 30 feet, and 35 percent a saturated thickness of about 15 feet.

Water-Bearing Characteristics. The yields of 35 industrial and public-supply wells range from 10 to 3,014 gal/min; the median yield is 300 gal/min. The specific capacities of these wells range from 5.9 to 447 (gal/min)/ft, and the median is 32 (gal/min)/ft. Thus, the median specific capacity of these wells is more than four times that of public-supply and industrial wells drilled in the fractured-rock aquifers. The diameters of the high-yield wells in the valley fill range from 8 inches to about 30 feet.

The capacities of domestic wells in the valley fill, although superior to their bedrock counterparts, are only about 6 percent that of the nondomestic wells in the valley fill. The poor capacity is due to the fact that they are not screened rather than to their depth, as the median depth of domestic wells is 45 feet and that of the nondomestic wells is only 36 feet. The casing extends to the bottom of the well so water can enter only through the end of the casing. Depths to water range from 2 to 70 feet below land surface. The greatest depths occur in wells on high-level terraces near the edge of the saturated valley-fill deposits. The estimated altitude of the water table in these deposits is shown on Plate 2.

Transmissivities of eight wells in the valley-fill deposits range from 325 to 28,000 ft^2/d. The median is 4,230 ft^2/d. The length of the tests ranged from 4 to 48 hours.

Most of the high-yield wells have been constructed at or near the confluence of major south-flowing streams with the West Branch of the Susquehanna River. The south-flowing streams have much steeper gradients than the West Branch, and probably carried large amounts of coarse materials during Pleistocene time, which they deposited in the valley of the West Branch. However, the depositional history of these deposits is very complex, and data are not sufficient to map them in detail. Consequently, the character of the materials is very difficult to predict from place to place, and test drilling will be needed to locate the best deposits available for the development of high-yield wells.

Optimum yields are obtained from wells constructed to receive water from at least 50 percent of the saturated thickness of the deposits. Where the saturated deposits are thin or fine grained, large-diameter wells (up to 30 feet in diameter, such as Ly-68) are constructed. Wells close to the streams may receive most of their water from streamflow; where a poor natural connection exists between the wells and streams, artificial connections are sometimes constructed. When large supplies of water are pumped from wells adjacent to streams, the streamflow may be substantially reduced.

In addition to having access to induced recharge from streamflow, the valley-fill deposits store considerable amounts of water. The long-term specific yield of these deposits is estimated to be about 20 percent of their saturated volume. If the average saturated thickness of these sediments is about 30 feet and their areal extent is 60 square miles, about 75 billion gal-

lons of water is stored in these rocks. For comparison purposes, the Williamsport Municipal Water Authority used less than 5 percent of this amount to supply all its customers in 1974. Thus, the unconsolidated valley-fill deposits constitute an extensive and important groundwater reservoir.

Water-Quality Characteristics. The field pH of water from the valley fill ranges from 5.0 to 7.0 and the median is 6.0, so these are the most acidic waters in the entire study area. The water is moderately hard and contains only moderate amounts of dissolved solids. The dissolved solids can be estimated by multiplying the specific conductance by 0.62. The temperature of the water, which ranged from 6.7 to 18°C, had the widest range of any of the aquifers, owing to the shallow occurrence of the water and the consequent influence of the air temperature.

Six complete chemical analyses by the U. S. Geological Survey and 27 partial analyses by the Survey and commercial laboratories were used in the water-quality evaluation. The median data indicate that the water is calcium sulfate-chloride in type. Excessive concentrations of iron were found in water from wells Ly–26, –125, –126, –178, and –233, and of manganese from wells Ly–125 and –126. All other constituents analyzed were below the maximum concentrations recommended by EPA.

SUMMARY

The rocks are divided into consolidated, fractured rocks and unconsolidated deposits that cover most of the area. The former include formations composed of carbonate rocks, shale, siltstone, and sandstone that range in age from Ordovician to Pennsylvanian. Water in these rocks primarily occurs in and moves through fractures and solution openings. The unconsolidated deposits are Quaternary in age. They are composed of particles that vary greatly in mineral composition and range in size from clay to large boulders. Water in these deposits occurs in and moves through the pore spaces between the sedimentary particles. Most of the groundwater moves through the shallow part of the zone of saturation, as evidenced by the poor quality of the water at depth.

Yield data from wells drilled in carbonate rocks, which underlie about eight percent of the area, indicate that wells located and constructed for high yield produce as much as 500 gal/min. Specific-capacity data indicate that about half of the wells can produce more than 200 gal/min. The average high-yield wells are no more than 250 feet deep (particularly in valley bottoms), use 70 feet of casing, and have water levels between 25 and 50 feet below land surface. Generally, the water from the carbonate rocks is neutral to slightly alkaline (pH, 7.0 to 7.4) and very hard (14 gpg), and contains concentrations of dissolved solids (400 to 500 mg/L) that are slightly less

than the maximum concentrations (500 mg/L) recommended by EPA (U. S. Environmental Protection Agency, 1977). The dominant cations are calcium and magnesium and the dominant anions bicarbonate and sulfate.

All of the few high-yield wells developed in sandstone are in the Ridgeley Member of the Old Port Formation. Yield data indicate that such wells produce as much as 400 gal/min. Specific-capacity data indicate that over half the wells can produce more than 200 gal/min. In general, the wells are no more than 250 feet deep and for optimum yield may be constructed with well screens and gravel packs where the sandstone is friable and tends to cave. The average water level is between about 20 and 50 feet below land surface. In general, the pH of water from the Ridgeley ranges from slightly acidic to slightly alkaline (6.5 to 7.3), the hardness from soft to moderately hard (1 to 6 gpg), and the dissolved-solids concentrations from low to moderate (94 to 264 mg/L). The dominant cations are generally calcium and magnesium, and the dominant anion is bicarbonate and sometimes also sulfate.

The Bald Eagle, Juniata, and Tuscarora Formations, the other sandstone formations in the area, may yield as much as 100 gal/min to some wells. The water from these sandstones is more acidic, softer, and has much lower concentrations of dissolved solids than that from the Ridgeley. The major cations are iron, calcium, magnesium, and sodium. The major anion is generally bicarbonate.

Wells properly located and developed for high yield in the siltstone may produce up to 200 gal/min and average between 50 and 100 gal/min. These wells are in most places no more than 400 feet deep, contain 25 to 35 feet of casing, and have water levels between 20 and 35 feet below land surface. The water has a pH between 6.8 and 7.4, a hardness of about 5 gpg, and moderate concentrations of dissolved solids. The dominant cation and anion are calcium and bicarbonate, respectively.

Yield data from wells drilled in the shale indicate that wells drilled for high yield in these rocks may produce up to 350 gal/min, and specific-capacity data indicate that half of the wells can produce 100 gal/min or more. They average about 200 feet in depth, contain 50 feet of casing, and have water levels about 20 to 30 feet below land surface. The pH of the water from these rocks is slightly acidic to neutral (6.5 to 7.0); the water is moderately hard (6 to 7 gpg), and has only moderate concentrations of dissolved solids. The dominant cation and anion are calcium and bicarbonate, respectively.

Wells in the unconsolidated valley-fill deposits produce up to 3,000 gal/min. Where saturated thickness of the valley-fill deposits is small or the deposits are fine grained, wells of large diameter (up to 30 feet) are constructed. In general, extremely large yields are sustained by streamflow when wells are near streams, which of course reduces streamflow. The aver-

age water from the valley-fill deposits has a pH of about 6 (acidic), is moderately hard (5 gpg), and has moderate concentrations of dissolved solids (100 mg/L).

Water-quality problems include excessive concentrations of iron, manganese, sulfate, chloride, dissolved solids, and hydrogen sulfide. Most of these problems occur in valley bottoms, and some of them could have been avoided by drilling shallower wells. In addition, concentrations of barium, cadmium, lead, nitrate, and zinc were locally found to exceed standards set by EPA for public drinking water in their drinking water regulations.

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GLOSSARY

Anticline. A fold in rocks in which the strata dip outward away from the axis of the fold. Opposite of *Syncline.*

Aquifer. A formation, group of formations, or part of a formation that contains sufficient saturated permeable material to yield significant quantities of water to wells and springs.

Bedrock. A general term for the rock, usually solid, that underlies soil or other unconsolidated or semiconsolidated surficial material.

Carbonate rocks. Rock composed primarily of minerals that contain the chemical radical CO_3. In the study area the rocks are limestone, $CaCO_3$, and dolomite, $Ca,Mg(CO_3)_2$.

Colluvium. A general term applied to loose and unconsolidated deposits, usually at the foot of a slope or a cliff, and brought there chiefly by gravity.

Conduit. A subterranean passage that is completely filled with water and that is under hydrostatic pressure.

Deformation. Any change in the original form or volume of rock masses produced by earth forces; folding, faulting, and solid flow are common modes of deformation.

Dip. The angle at which a bed or any planar feature is inclined from the horizontal.

Evapotranspiration. Loss of water from a land area through transpiration of plants and evaporation from the soil.

Fault. A surface or zone of fracture in rock along which movement has taken place.

Geothermal gradient. The temperature increase in the outer part of the earth's crust, which is about 1 °F (0.6 °C) for each 100 feet of depth.

Groundwater. That part of the subsurface water in the zone of saturation.

Groundwater discharge. Release of groundwater in springs, seeps, or wells from the groundwater reservoir.

Groundwater recharge. Addition of water to the groundwater reservoir by infiltrating precipitation or seepage from streambeds.

Groundwater reservoir. See *Aquifer.*

Head. Water-level elevation in a well, or elevation to which the water in a flowing well will rise in a pipe extended high enough to stop the flow.

Joints. Fractures in rock along which no appreciable movement has occurred.

Permeability. The capacity of a rock, sediment, or soil to transmit a fluid; it is a measure of the relative ease of fluid flow under unequal pressure.

Porosity. The ratio of the total volume of openings in a sample of rock or soil compared to the total volume of the sample. It is usually stated as a percentage.

Potentiometric surface. A surface that represents the static head of an aquifer.

Reported well yield. The short-term yield of a well as reported by well drillers.

Saturated zone. That part of the water-bearing material in which all voids are completely filled with water.

Sinkhole. A depression in an area underlain by carbonate rock that is formed by solution of carbonate rock and collapse of overlying material into solution cavities.

Solution cavity. Any void, generally an enlargement of a fracture opening, caused by natural solution activity in limestone or dolomite.

Specific capacity. The yield of a well, in gallons per minute, divided by the drawdown of water level in the well, in feet, for some specific period of pumping.

Specific conductance. A measure of the capacity of a substance to conduct an electrical current. It is measured in micromhos per centimeter at 25 degrees Celsius and is equal to 10,000 divided by the electrical resistivity, in ohm meters. Water having small amounts of dissolved solids have low conductances, whereas waters having comparatively large amounts of dissolved solids have high conductances.

Specific yield. The ratio of (1) the volume of water that the rock or soil, after being saturated, will yield by complete gravity drainage to (2) the volume of rock or soil. In the natural environment, specific yield is only an approximate measure of the storage capacity of an aquifer because gravity drainage is never complete.

Static head or water level. The water level in a well when the well is not being pumped and when the water level is unaffected by any prior pumping of the well.

Storage coefficient. The volume of water an aquifer releases from or takes into storage per unit surface area of the aquifer per unit change in head.

Structure. The internal and external geometry of rock units, as evidenced by features produced in the rock by movements after deposition and commonly after consolidation of the rock.

Surface water. That water on the surface of the earth. Surface water is generally a combination of overland runoff and groundwater discharge, the proportions varying from almost 100 percent overland runoff during periods of high-intensity rain to 100 percent groundwater discharge during periods of little or no rain.

Swallow hole. A closed depression (sinkhole) into which all or part of a stream disappears.

Syncline. A fold in the rocks in which the strata dip inward toward the axis. Opposite of *Anticline.*

Till. Nonsorted, nonstratified material, ranging in size from clay to boulders; deposited directly by ice.
Transmissivity. The rate at which water is transmitted through a unit width of an aquifer under a unit hydraulic gradient.
Water table. The upper surface of the zone of saturation.
Zone of saturation. The zone below the water table in which all openings are saturated.

CONVERSION FACTORS

Conversion factors for inch/pound and SI metric units of measurement

Inch-pound	*Multiply by*	*Metric*
inch	2.540	cm (centimeter)
foot	3.048×10^{-1}	m (meter)
mile	1.609	km (kilometer)
square mile	2.590	km^2 (square kilometer)
billion gallons	3.785×10^6	kL (kiloliters)
gal/min (gallons per minute)	6.308×10^{-2}	L/s (liters per second)
gal/d (gallons per day)	3.785	L/d (liters per day)
Mgal/d (million gallons per day)	3.785×10^3	kL/d (kiloliters per day)
(gal/min)/ft (gallons per minute per foot)	2.069×10^{-1}	(L/s)/m (liters per second per meter)
(gal/d)/ft (gallons per day per foot)	1.242×10^1	(L/d)/m (liters per day per meter)
ft^2/d (feet squared per day)	9.293×10^{-2}	m^2/d (meters squared per day)
gpg (grains per gallon)	1.710×10^1	mg/L (milligrams per liter)
(Mgal/d)/mi^2 (million gallons per day per square mile)	1.461×10^3	(kL/d)/km^2 (kiloliters per day per square kilometer)

TABLE 10. RECORD OF WELLS

Well location: The number is that assigned to identify the well. It is prefixed by a two-letter abbreviation of the county. The lat-long is the coordinates in degrees and minutes of the southeast corner of a 1-minute quadrangle within which the well is located.

Use: C, commercial; F, fire; H, domestic; I, irrigation; N, industrial; P, public supply; S, stock; T, institution; U, unused; Z, other.

Topographic setting: D, depression; H, hilltop; S, hillside; U, undulating; V, valley flat; W, draw.

Aquifer: Qal, Quaternary valley-fill deposits; Mp, Pocono Formation; Dck, Catskill Formation; Dlh, Lock Haven Formation; Db, Brallier Formation; Dtr, Trimmers Rock Formation; Dh, Harrell Formation; Dml, Mahantango Formation, lower member; Dmt, Mahantango Formation, Tully Member; Dmr, Marcellus Formation; Don, Onondaga Formation; Do, Old Port Formation; DSk, Keyser Formation; Sto, Tonoloway Formation; Swc, Wills Creek Formation; Sb, Bloomsburg Formation; Sm, Mifflintown Formation; Sr, Rose Hill Formation; Oj, Juniata Formation; Obe, Bald Eagle Formation; Or, Reedsville Formation; Oa, Antes Formation; Oc, Coburn Formation; Os, Salona Formation; Oro, Rodman Formation; Olh, Linden Hall Formation; Osn, Snyder Formation; Oh, Hatter Formation, Ol, Loysburg Formation; Obf, Bellefonte Formation.

Lithology: dol, dolomite; ls, limestone; sg, sand and gravel; ss, sandstone; sh, shale; st, siltstone.

Static water level: Depth--F, flows but head is not known. Date--month/last two digits of year.

Reported yield: gpm, gallons per minute.

Specific capacity: gpm/ft, gallons per minute per foot of drawdown.

Hardness: gpg, grains per gallon.

Specific conductance: Deg C, degrees Celsius.

TABLE 10.

Well location: Number	Well location: Lat-Long	Owner	Driller	Date completed	Use	Altitude of land surface (feet)	Topographic setting	Aquifer/ lithology
								LYCOMING
Ly- 2	4114-7658	McDaniels Oairy	---	---	N	520	V	Don/sh
3	4113-7648	Yetter Bros.	---	---	H	570	H	Sb/sh
4	4113-7648	C. W. Sones	---	---	S	570	S	Sb/ls
5	4114-7646	Henry Kilgas	E. W. Artley	---	H	540	V	Qal/sg
6	4114-7655	Russell Derick	---	---	---	530	V	Sto/ls
7	4114-7658	John Peters	C. W. Yarrison	---	N	520	V	Don/sh
8	4114-7657	F. M. Haug	---	---	---	510	V	Do/ls
9	4112-7655	O. 8. Plasan	---	1934	H	1200	S	Oj/ss
10	4113-7659	William Kaufman	---	---	H	640	S	Sr/sh
11	4108-7654	Bruce Waltman	---	1931	H	630	H	Dml/sh
12	4112-7649	State Corr. Inst.	---	---	P	535	S	Qal/sg
13	4112-7649	do.	---	---	P	---	S	Qal/sg
14	4111-7649	Clayton Heilman	E. W. Artley	---	H	515	S	Swc/sh
15	4111-7652	Frank Mitsker	---	1929	H	620	S	DSk/ls
16	4110-7652	G. M. Staib Dairy	---	---	N	485	V	Dml/st
17	4110-7652	I. H. Groom Oairy	---	---	N	495	S	Dmt/ls
18	4111-7656	Merle Page	---	---	H	695	S	Sb/sh
19	4111-7646	Muncy Water Supply Co.	---	---	P	520	V	Qal/sg
20	4112-7647	Muncy Ice Company	---	---	N	505	V	Swc/ls
21	4112-7647	8auzhof Ice Cream Co.	---	1925	N	510	V	Swc/ls
22	4112-7647	Muncy Water Supply Co.	---	---	---	485	V	Sb/sh
23	4112-7547	do.	---	---	---	485	V	Sb/sh
24	4112-7647	do.	---	---	---	485	V	Sb/sh
25	4112-7647	do.	---	---	P	485	V	Sb/sh
26	4114-7702	Williamsport Munic. Water Auth.	---	---	P	515	V	Qal/sg
28	4114-7659	Charles Williams	C. W. Yarrison	---	H	520	V	Dmr/sh
29	4113-7704	Keystone Glue Co.	Sprague & Henwood, Inc.	---	N	530	V	Qal/sg
30	4113-7704	do.	---	---	N	530	V	Qal/sg
31	4114-7702	J. K. Mosser Leather Co.	---	---	N	530	V	Qal/sg
32	4114-7702	do.	---	1890	N	530	V	Dml/sh
33	4114-7702	Williamsport Munic. Water Auth.	---	1891	P	525	V	Qal/sg
34	4114-7701	J. K. Rishel Furniture Co.	---	---	U	525	V	Oml/sh
35	4114-7701	do.	---	1900	H	525	V	Qal/sg
36	4114-7700	Stewart Artificial Ice Co.	C. W. Yarrison	1932	N	520	V	Do/ss
37	4114-7700	do.	---	1920	N	520	V	Don/ls
38	4114-7700	Sun-Gazzette Co.	C. W. Yarrison	1929	N	535	V	Don/sg
39	4114-7700	Williamsport Narrow Fab. Co.	do.	---	---	560	V	Dml/sh
40	4113-7709	A. O. 8rown	---	---	H	575	S	Dml/sh
41	4113-7708	Paul Grove	---	---	H	620	S	Dmt/ls
42	4113-7708	H. F. Fritz	---	---	H	635	S	Dmt/ls
43	4113-7708	Ott Grove	---	---	H	605	S	Dmt/ls
44	4114-7705	L. L. Oowdy	---	---	U	580	V	Db/sh
45	4113-7713	Joe Gray	---	---	---	560	V	Ob/sh
46	4114-7713	W. P. Steinbacher	---	---	H	695	V	Ock/sh
48	4113-7659	William McGinis	---	---	N	625	V	Sm/st
49	4113-7702	Frank Bennett	---	---	H	595	S	Sb/sh
50	4113-7702	Floyd Brennan	C. W. Yarrison	---	H	580	S	Sb/st
51	4114-7702	Williamsport Munic. Water Auth.	---	---	P	515	V	Qal/sg
53	4121-7652	Arthur Woolever	E. W. Artley	---	H	765	V	Qal/sg
54	4115-7659	E. W. Lewis	---	---	I	535	V	Oml/sh
57	4120-7655	Robert Gilmore	---	---	H	620	S	Qal/sg
58	4120-7655	Oliver Nearily	---	---	H	670	S	Qal/sg
60	4119-7656	Strobel	---	---	H	700	V	Dck/sh
61	4117-7650	Louis Miller	---	---	S	715	V	Dck/sh
62	4117-7654	Methodist E. Church	---	1928	H	595	V	Dlh/st
63	4118-7654	George Fischer	C. W. Yarrison	---	H	585	V	Qal/sg
64	4118-7645	Charles Mutchler	E. W. Artley	---	H	1130	H	Dck/sh
65	4115-7646	H. B. Elliot	---	---	H	660	D	Dlh/sh
66	4115-7655	Montoursville Water Co.	---	---	P	535	V	Qal/sg
67	4116-7658	Silas Wheeler	C. W. Yarrison	---	H	840	H	Db/sh
68	4113-7702	Williamsport Munic. Water Auth.	---	---	P	515	V	Qal/sg
70	4121-7704	H. A. McKentire	C. W. Yarrison	1928	H	645	V	Qal/sg
72	4115-7702	Phillip Antes	do.	1926	U	545	V	Db/sh
79	4119-7705	Mrs. Swiker	---	---	H	595	V	Dlh/ss
80	4115-7703	O. F. Kilmer	C. W. Yarrison	1928	H	660	S	Db/sh
81	4115-7702	Kershner	---	1928	H	535	V	Db/sh
84	4114-7702	Williamsport Munic. Water Auth.	---	---	P	515	V	Qal/sg
89	4115-7643	Hughesville 8or.	---	---	U	585	V	Qal/sg
93	4114-7644	B. F. Kahler	E. W. Artley	---	S	650	S	Dml/sh

(CONTINUED)

Total depth below land surface (feet)	Casing: Depth (feet)	Casing: Diameter (inches)	Depth(s) to water-bearing zone(s) (feet)	Static water level: Depth below land surface (feet)	Static water level: Date measured (mo/yr)	Reported yield (gpm)	Specific capacity (gpm/ft)	Hardness (gpg)	Specific conductance (micromhos at 25°C)	pH	Well number
COUNTY											
46	42	6	45	11	6/33	50	8.3	---	---	---	Ly- 2
135	45	---	---	40	9/31	20	---	---	---	---	3
135	40	---	---	40	---	3	---	---	---	---	4
40	40	6	---	10	---	10	---	---	---	---	5
85	54	6	---	20	---	25	1.3	---	---	---	6
186	---	8	---	10	---	300	---	---	---	---	7
330	87	8	---	13	9/31	125	2.4	---	---	---	8
48	40	6	---	4	1934	18	---	1	---	---	9
113	87	6	---	45	---	3	---	---	---	---	10
135	53	6	---	35	10/31	10	---	---	---	---	11
71	71	10	---	10	5/65	150	21.7	1	60	---	12
30	30	---	---	---	---	---	---	1	60	---	13
40	35	6	---	18	---	5	---	---	---	---	14
126	115	6	123	60	1929	8	---	---	---	---	15
105	55	6	---	34	7/35	13	1.3	---	---	---	16
30	---	6	---	---	---	10	---	---	---	---	17
138	90	6	---	35	1928	10	---	---	---	---	18
22	22	---	---	5	1935	400	29	---	---	---	19
302	45	8	300	13	7/35	130	4.5	32	---	---	20
113	80	8	---	35	8/25	25	---	---	---	---	21
80	28	8	---	7	---	---	---	---	---	---	22
140	32	8	---	7	---	---	---	---	---	---	23
80	30	8	---	7	---	---	---	---	---	---	24
140	34	8	---	7	1935	166	9.8	---	---	---	25
22	22	---	---	7	4/72	800	219	---	220	6.0	26
50	38	6	---	---	---	---	---	---	---	---	28
55	55	28	50	25	---	225	---	---	---	---	29
55	42	30	50	25	---	250	14.5	---	---	---	30
35	---	8	---	10	---	---	---	---	---	---	31
600	70	6	---	6	---	240	---	---	---	---	32
23	23	---	---	---	---	---	---	---	---	---	33
140	60	6	---	30	---	---	---	---	---	---	34
50	50	6	---	---	---	---	---	---	---	---	35
244	50	8	---	22	1932	400	8.0	---	---	---	36
189	48	6	---	22	1920	---	---	---	---	---	37
62	62	6	---	10	1929	21	---	6	---	---	38
186	62	6	---	24	---	14	---	7	---	---	39
72	30	6	---	30	1935	3	---	---	---	---	40
140	110	6	---	30	---	---	---	---	---	---	41
97	67	6	---	40	---	---	---	---	---	---	42
335	40	6	---	40	---	---	---	---	---	---	43
---	---	6	---	F	7/35	---	---	---	---	---	44
60	22	6	---	10	---	---	---	---	---	---	45
48	---	6	---	---	---	---	---	---	---	---	46
144	97	6	---	62	---	100	8.3	---	---	---	48
101	73	6	---	82	4/35	20	---	---	---	---	49
111	65	6	---	40	9/34	10	---	---	---	---	50
28	28	---	---	8	4/72	350	35	---	---	---	51
48	43	6	---	33	---	---	---	---	---	---	53
153	34	8	---	13	10/30	100	2.9	---	---	---	54
37	37	6	---	20	---	20	---	---	---	---	57
52	49	6	---	30	---	---	---	---	---	---	58
53	45	6	---	15	---	25	---	---	---	---	60
55	5	6	---	5	---	2	---	---	---	---	61
124	48	6	---	35	1928	5	---	---	---	---	62
43	43	6	---	26	---	5	---	---	---	---	63
72	25	6	---	35	---	4	---	---	---	---	64
50	8	6	---	10	---	---	---	---	---	---	65
30	30	---	---	18	---	350	58.0	---	---	---	66
212	---	---	---	---	---	6	---	---	---	---	67
28	28	360	---	8	4/72	3014	447	---	200	---	68
63	63	6	---	---	---	---	---	---	---	---	70
318	18	6	---	25	1/26	---	---	---	---	---	72
46	27	6	---	15	---	3	---	---	---	---	79
175	40	6	---	55	4/28	---	---	---	---	---	80
36	27	6	---	15	1928	---	---	---	---	---	81
30	30	---	---	8	4/72	500	---	---	---	---	84
96	96	4	---	5	---	200	---	2	---	---	89
70	28	6	---	15	---	7	---	---	---	---	93

TABLE 10.

Well location		Owner	Driller	Date completed	Use	Altitude of land surface (feet)	Topographic setting	Aquifer/lithology
Number	Lat-Long							
Ly- 94	4114-7643	Rishel Furniture Co.	---	---	H	575	V	Oml/sh
95	4110-7642	J. R. Opp	E. W. Artley	---	H	575	V	Otr/sh
99	4115-7643	Hughesville Bor.	Sprague & Henwood, Inc.	---	P	585	V	Qal/sg
103	4114-7652	H. A. Miller	---	1927	H	625	S	Sto/ls
104	4114-7659	Williamsport Milk Product Co.	C. W. Yarrison	---	N	530	V	
105	4114-7654	J. H. Rakestraw	do.	1926	U	530	V	Qal/sg
106	4114-7649	Henry Brock	Miller	---	H	525	V	Sb/ls
108	4112-7716	John Lehman	C. W. Yarrison	1928	H	590	V	Oml/sh
109	4112-7715	Crystal Ice and Coal Co.	---	---	N	585	V	Oml/ls
112	4124-7659	U. S. Geol. Survey	Germania Well Drilling Co.	1967	U	1400	S	Dk/st
120	4113-7647	Muncy Munic. Water Auth.	---	1937	P	480	V	Qal/sg
121	4113-7747	do.	---	1937	P	480	V	Qal/sg
122	4113-7647	do.	---	1937	P	480	V	Qal/sg
125	4112-7715	Jersey Shore Water Co.	Layne-New York Co., Inc.	1964	Z	550	V	Qal/sg
126	4112-7715	do.	do.	1964	Z	545	V	Qal/sg
128	4110-7646	C. R. Maurer	Gordon E. Hill	1970	H	690	S	Otr/st
129	4110-7649	David Rupert	do.	1970	H	580	S	Dtr/---
130	4112-7645	Douglas Laidacker	George Turner	1969	H	525	V	Oo/ls
131	4113-7647	Henry Heck	Gordon E. Hill	1966	H	490	V	Sb/sh
132	4113-7646	Ronald Ludwig	George Turner	1971	H	530	V	Swc/ls
133	4113-7646	George Hall	do.	1969	H	530	V	Sto/ls
134	4113-7647	George H. Roller Co.	R. R. Hornberger	1970	H	510	S	Sm/ls
135	4113-7647	Audio Bible Society	do.	1967	H	495	V	Sm/ls
136	4110-7651	Charles Sherwood	George Turner	1968	H	530	S	Omr/sh
137	4111-7649	John Hauck	do.	1970	H	530	S	Qal/sg
138	4113-7648	Merle Brucklacker	Gordon E. Hill	1970	H	550	W	Sb/sh
139	4114-7648	James Gleason	do.	1968	H	540	S	Sb/sh
140	4114-7648	do.	do.	1970	H	520	S	Sb/sh
141	4114-7648	Norman Fry	George Turner	1968	H	535	V	Do/ls
142	4114-7648	Kenneth Snyder	do.	1971	H	535	V	Do/ls
143	4114-7646	Artley Fry	Gordon E. Hill	1968	H	560	S	Do/ls
144	4115-7652	Paul Huff	Max A. Lundy	1967	H	715	S	Oml/ls
145	4116-7653	Robert Falk	George Turner	1971	H	880	H	Db/st
146	4116-7653	James Bruner	do.	1968	H	900	S	Ob/st
147	4116-7656	Francis Kyler	do.	1969	H	590	S	Ob/st
148	4115-7656	G. T. Smith	R. R. Hornberger	1966	H	555	S	Oml/sh
149	4115-7656	Lloyd Cotner	do.	1967	H	615	S	Oon/ls
150	4115-7657	Richard Kelchner	George Turner	1968	H	670	S	Ob/sh
151	4115-7657	William Slavin	Germania Well Drilling Co.	1966	H	635	S	Omt/sh
152	4114-7653	Henry Sitler	George Turner	1966	C	535	S	Sto/ls
153	4111-7653	Richard Flick	---	1968	H	650	S	Sto/sh
154	4110-7652	Art Bastian	George Turner	1969	H	605	H	Do/sh
155	4110-7652	Richard Weeks	do.	1968	H	605	S	Qal/sg
156	4110-7653	Dorsey Creveling	Gordon E. Hill	1971	H	665	S	Dh/sh
157	4110-7653	Ben Fritz	George Turner	1969	H	650	S	Don/ls
158	4108-7658	T. S. Moore	Norman Hagenbuch	1966	H	580	S	Dmr/sh
159	4118-7700	P. W. Strouse	Germania Well Drilling Co.	1967	H	1020	H	Dlh/st
160	4113-7708	Harold Sones	Gordon E. Hill	1966	H	565	V	Omt/ls
161	4111-7713	Paul Naiel	Harris W. Barto	1968	H	600	S	Oml/sh
162	4111-7713	Herbert Darley	do.	1968	H	645	H	Omr/sh
163	4111-7714	William Albright	do.	1969	H	585	S	Oon/ls
164	4108-7714	Kenneth Welshans	George Turner	1967	H	760	S	Obf/dol
165	4116-7646	Joseph Wise	do.	1968	H	900	S	Olh/st
166	4117-7649	William Bertolet	do.	1968	H	1030	S	Dlh/sh
167	4116-7650	T J. Fox	do.	1970	H	1025	S	Dlh/st
168	4116-7650	Donald Nelson	do.	1968	H	910	S	Ob/st
169	4115-7649	Chris Sauter	George Turner	1966	H	740	S	Omt/ls
170	4115-7651	Ronald Vonada	Gordon E. Hill	1971	H	700	S	Omt/ls
171	4115-7650	James A. Manns	George Turner	1968	H	840	S	Ob/st
172	4116-7652	Earl Morrison	do.	1968	H	925	H	Olh/sh
173	4109-7706	F. W. Stopper	do.	1966	H	1370	S	Or/sh
174	4108-7702	Donald Randall	do.	1967	H	705	S	Sr/sh
175	4113-7713	---	---	---	U	540	V	Qal/sg
176	4114-7652	Bella Vista Village Water Co. Inc.	Harrisburg's Kohl Bros.	1956	P	665	H	Sto/ls
177	4114-7654	Montoursville Bor.	Layne-New York Co., Inc.	1953	P	530	V	Qal/sg
178	4115-7655	do.	do.	1957	P	530	V	Qal/sg
179	4116-7655	Lycoming County	---	1939	P	545	S	Db/st
180	4119-7655	Pa. Game Comm.	Harrisburg's Kohl Bros.	1949	S	615	V	Dlh/st
181	4108-7711	H. E. Dougherty	---	---	U	810	S	Ol/ls
182	4108-7708	H. E. Clark	C. S. Garber & Sons, Inc.	1973	S	940	S	Oa/sh
183	4114-7702	Williamsport Munic. Water Auth.	---	---	P	515	V	Qal/sg
184	4114-7702	do.	---	---	P	515	V	Qal/sg
185	4114-7702	do.	---	---	P	515	V	Qal/sg

(CONTINUED)

Total depth below land surface (feet)	Casing Depth (feet)	Casing Diameter (inches)	Depth(s) to water-bearing zone(s) (feet)	Static water level Depth below land surface (feet)	Static water level Date measured (mo/yr)	Reported yield (gpm)	Specific capacity (gpm/ft)	Hardness (gpg)	Specific conductance (micromhos at 25 C)	pH	Well number
64	30	6	---	18	---	20	---	---	---	---	Ly- 94
98	---	---	---	33	---	4	---	---	---	---	95
48	38	12	---	10	10/75	275	55	2	110	6.0	99
200	100	6	196	124	1927	25	0.63	---	---	---	103
85	75	10	---	35	---	165	9.2	---	---	---	104
40	38	6	---	---	---	---	---	---	---	---	105
237	---	---	---	25	---	9	---	---	---	---	106
80	28	6	---	---	---	---	---	---	---	---	108
117	40	6	---	50	---	38	---	15	---	---	109
200	23	6	125	90	11/71	2	.05	8	320	---	112
28	22	10	---	10	11/72	180	39	7	320	6.7	120
28	23	8	---	10	11/72	150	37.5	10	380	6.5	121
28	23	8	---	10	11/72	275	32.6	---	---	---	122
52	---	8	---	22	11/64	125	5.9	8	---	---	125
33	28	2	---	---	12/64	10	---	5	---	---	126
100	11	6	26;96	0	5/70	5	0.05	---	---	---	128
85	16	6	64	38	5/70	20	1	---	---	---	129
74	31	6	74	---	---	35	---	---	---	---	130
60	22	6	45;55	8	6/66	15	1.9	---	---	---	131
90	80	6	90	30	4/71	50	---	---	---	---	132
82	71	6	82	---	---	12	---	---	---	---	133
171	41	6	80;120;166	28	8/70	20	0.36	---	---	---	134
215	39	6	73;101;152	50	6/67	20	0.12	---	---	---	135
129	32	6	125	---	---	4	---	---	---	---	136
80	80	6	---	---	---	30	---	---	---	---	137
100	56	6	82	35	1/70	15	0.43	---	---	---	138
80	22	6	40;70	10	9/68	6	0.09	---	---	---	139
90	34	6	68	15	4/70	18	0.4	---	---	---	140
35	27	6	34	10	6/68	12	---	7	290	6.5	141
48	41	6	48	15	3/71	40	---	---	---	---	142
127	25	6	123	40	10/68	9	0.11	---	---	---	143
177	87	6	90;125;177	---	11/67	12	---	---	---	---	144
297	22	6	290	---	---	3	---	---	---	---	145
215	21	6	212	---	---	9	---	---	---	---	146
298	31	6	298	---	---	1	---	---	---	---	147
195	24	6	70;130;193	30	10/66	12	.075	---	---	---	148
210	116	6	150;190;205	100	6/67	20	0.08	---	---	---	149
335	21	6	335	---	---	3	---	---	---	---	150
307	30	6	120;300	---	---	5	---	---	---	---	151
112	40	6	60;107	25	4/66	50	---	---	---	---	152
130	103	6	118	52	3/68	15	0.24	---	---	---	153
93	89	6	93	---	---	10	---	---	---	---	154
92	92	6	---	---	---	15	---	---	---	---	155
135	102	6	120	93	3/71	15	0.88	---	---	---	156
134	41	6	130	---	---	6	---	---	---	---	157
273	20	6	---	60	7/66	2	0.01	3	120	7.6	158
160	24	6	50;124;160	80	1/67	15	0.33	---	---	---	159
85	31	6	55;70	25	6/66	6	---	---	---	---	160
52	---	6	48	18	8/68	16	0.89	---	---	---	161
180	96	6	175	90	1/68	7	0.09	---	---	---	162
73	22	6	73	63	5/69	10	---	---	---	---	163
154	131	6	150	75	6/67	4	---	---	---	---	164
92	42	6	90	8	5/68	4	---	---	---	---	165
134	31	6	100;134	F	9/68	30	---	5	245	7.2	166
400	107	6	400	60	10/70	5	---	---	---	---	167
277	30	6	75;150	30	5/68	2	---	---	---	---	168
152	32	6	---	---	---	20	---	---	---	---	169
135	92	6	123	93	6/71	10	0.29	---	---	---	170
154	34	6	154	112	6/68	10	---	---	---	---	171
302	44	6	197	---	---	12	---	---	---	---	172
195	69	6	155;190	---	---	2	---	---	---	---	173
318	23	6	---	---	---	3	---	---	---	---	174
11	---	---	---	7	---	---	---	---	---	---	175
699	142	6	135;500;690	120	1/56	80	0.73	9	---	---	176
62	52	18	---	33	10/53	350	29	6	---	---	177
43	33	12	---	9	8/57	310	17	3	158	5.5	178
560	28	8	---	20	10/67	100	---	5	240	7.8	179
105	52	6	57	21	7/74	13	0.23	8	420	6.75	180
35	---	60	---	29	9/73	---	---	---	---	---	181
250	40	6	25;210;235	41	9/73	17	1.3	11	440	7.5	182
30	30	---	---	8	5/72	2004	398	---	280	---	183
28	28	---	---	8	4/72	1302	252	---	240	---	184
32	32	---	---	8	7/42	300	---	---	---	---	185

TABLE 10.

Well location								
Number	Lat-Long	Owner	Driller	Date completed	Use	Altitude of land surface (feet)	Topographic setting	Aquifer/ lithology
Ly- 186	4113-7702	Pa. Oept. of Transp.	Harrisburg's Kohl 8ros.	1972	U	515	V	Qal/sg
187	4113-7702	do.	do.	1972	U	515	V	Qal/sg
188	4113-7702	do.	do.	1972	U	515	V	Qal/sg
189	4114-7702	do.	do.	1972	U	515	V	Qal/sg
190	4114-7702	do.	do.	1972	U	515	V	Qal/sg
191	4114-7702	do.	do.	1972	U	515	V	Qal/sg
192	4114-7702	do.	do.	1972	U	515	V	Qal/sg
193	4114-7702	do.	do.	1972	U	515	V	Qal/sg
194	4108-7712	Newton Welshans	---	1910	U	710	5	Obf/dol
195	4109-7712	Lycoming 5ilica 5and Co.	---	---	H	660	W	Osn/ls
196	4112-7657	Pa. Dept. of Environmental Resources	---	---	H	1982	H	Oj/st
197	4107-7713	5amuel Lehman	---	1957	H	795	S	Oh/ls
198	4109-7713	Henry Gordner	C. S. Garber & Sons, Inc.	1973	H	805	S	Olh/ls
199	4108-7712	Jud Hinaman	---	---	U	775	5	Obf/dol
200	4107-7712	O. 8. 8oyer	C. 5. Garber & Sons, Inc.	1973	H	840	5	Os/ls
201	4109-7711	N. A. Sayah	Norman Hagenbuch	1967	P	805	H	Oh/ls
202	4109-7713	Lycoming 5ilica Sand Co.	do.	---	N	665	V	Oh/ls
203	4114-7653	Pa. Power and Light Co.	Germania Well Orilling Co.	1973	N	560	S	5to/ls
204	4118-7704	Germania Well Drilling Co.	do.	1963	H	600	V	Dck/sh
205	4114-7654	Sylvania Electric Co., GTE	do.	1972	N	530	V	Qal/sg
206	4114-7654	do.	do.	1972	N	530	V	Qal/sg
207	4110-7708	Roman 5huler	---	---	U	1122	5	Or/sh
208	4110-7708	do.	---	---	U	1140	5	Or/sh
209	4110-7707	Immaculate Conception Parish	Andrew E. Trautner	1965	H	1400	5	Or/sh
210	4107-7712	Thomas Hinaman	C. S. Garber & 5ons, Inc.	---	H	790	S	Olh/ls
211	4114-7655	Montoursville Bor.	Layne-New York Co., Inc.	1962	P	500	V	Qal/sg
212	4114-7656	do.	do.	1969	P	502	V	Qal/sg
213	4107-7712	William Welahans	C. S. Garber & 5ons, Inc.	1973	H	960	5	Oa/sh
214	4107-7712	J. O. 8ergstrum	do.	1973	H	880	S	Oc/ls
215	4109-7655	Lycoming County	---	1973	U	844	S	Dh/sh
216	4109-7654	do.	---	1973	U	829	5	Dh/sh
217	4109-7654	do.	---	1973	U	722	5	Dml/ls
218	4109-7655	do.	---	1973	U	695	S	Dml/ls
219	4113-7702	Corps of Engineers	Layne-New York Co., Inc.	1973	U	510	V	Qal/sg
220	4113-7702	do.	do.	1973	U	510	V	Qal/sg
221	4113-7702	do.	do.	1973	U	510	V	Qal/sg
222	4110-7655	Williamsport Recreational Auth.	Harrisburg's Kohl 8ros.	1963	C	665	H	Oml/sh
223	4110-7655	do.	do.	1963	1	625	S	Don/sh
224	4110-7654	Williamsport Area Community Coll.	do.	1970	T	655	W	Dml/sh
225	4110-7654	West Company Plastics Div.	Germania Well Drilling Co.	1962	N	610	5	Dml/sh
226	4110-7654	do.	do.	1965	N	610	5	Dml/sh
227	4110-7708	Don 5weet	Andrew E. Trautner	1972	H	1015	5	Oa/sh
228	4111-7653	Montgomery Water-Sewer Auth.	Wieand 8rothers	1968	P	495	V	Do/ss
229	4110-7651	do.	do.	1968	P	515	V	Do/ss
230	4109-7652	do.	do.	1968	U	490	V	Dtr/sh
231	4111-7651	do.	do.	1968	U	520	V	Do/ss
232	4110-7651	do.	do.	1968	U	490	V	Dml/sh
233	4113-7647	Muncy Water Co.	Harrisburg's Kohl 8ros.	1973	P	480	V	Qal/sg
234	4113-7648	Dr. Shoemaker	do.	1965	U	525	H	Sr/sh
235	4112-7647	Kenneth Bryfogle	do.	1965	U	480	V	Sm/ls
236	4112-7647	Muncy Water-5ewer Auth.	---	---	U	485	V	Sb/sh
237	4110-7706	E. L. Day	C. S. Garber & Sons, Inc.	1973	H	1590	H	Obe/ss
238	4111-7704	Galen Twigg	do.	1973	H	1405	5	Obe/ss
239	4108-7711	L. G. Ream	Robert L. 8rosius	1958	U	805	5	Olh/ls
240	4108-7713	J. R. Fenstermaker	---	---	U	780	V	Ob/dol
241	4108-7713	M. E. 5tairs	George Turner	1974	H	760	V	Ob/dol
242	4109-7708	Joseph 5teinbacher	Andrew E. Trautner	1972	H	960	5	Oa/sh
243	4111-7716	West Company	Germania Well Drilling Co.	1968	U	665	V	Dmr/sh
244	4119-7654	Pa. Game Comm.	C. W. Yarrison	1933	H	602	V	Dlh/sg
245	4110-7657	Maple Hill Community Ctr.	Germania Well Drilling Co.	---	H	635	V	Swc/st
246	4119-7655	Pa. Game Comm.	Harrisburg's Kohl 8ros.	1950	H	590	V	Olh/st
247	4118-7655	do.	C. W. Yarrison	1939	H	582	V	Qal/sg
248	4119-7654	do.	Germania Well Orilling Co.	1948	5	603	V	Dlh/st

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otal epth elow and rface eet)	Casing Depth (feet)	Casing Diameter (inches)	Depth(s) to water-bearing zone(s) (feet)	Static water level: Depth below land surface (feet)	Static water level: Date measured (mo/yr)	Reported yield (gpm)	Specific capacity (gpm/ft)	Hardness (gpg)	Specific conductance (micromhos at 25°C)	pH	Well number
40	48	6	---	5	4/72	---	---	---	---	---	Ly- 186
48	48	6	---	7	5/72	---	---	---	---	---	187
46	48	6	---	6	5/72	---	---	---	---	---	188
45	45	6	---	8	4/72	---	---	---	---	---	189
47	45	6	---	8	5/72	---	---	---	---	---	190
46	46	6	---	6	5/72	---	---	---	---	---	191
44	44	6	---	9	5/72	---	---	---	---	---	192
45	45	6	---	7	5/72	---	---	---	---	---	193
85	23	6	25	17	10/73	3	0.04	20	590	---	194
80	---	6	---	30	10/73	6	6.25	28	775	7.0	195
250	---	6	---	69	10/73	---	---	2	70	5.5	196
168	148	6	---	120	10/73	5	0.66	11	320	6.5	197
300	62	6	---	157	11/73	3	0.1	20	545	7.3	198
105	---	6	---	73	11/73	8	0.27	22	600	7.5	199
425	125	5	191;405	191	5/73	30	0.13	---	---	---	200
205	32	6	---	139	11/73	8	1.36	65	1450	6.5	201
115	---	8	---	25	12/73	59	43.4	11	300	7.0	202
313	208	6	225;290	45	10/73	66	1.0	9	260	6.8	203
92	60	6	---	20	10/73	5	0.2	9	380	6.5	204
56	56	8	---	28	10/73	---	---	---	---	---	205
56	56	12	---	28	10/73	---	---	---	---	---	206
36	36	60	---	35	10/73	---	---	---	---	---	207
12	12	48	---	4	10/73	---	---	5	200	5.5	208
232	---	6	---	76	10/73	7	0.09	5	200	6.0	209
360	100	6	320;337;345	120	11/73	6	0.25	20	560	7.0	210
45	35	18	---	11	8/62	510	20	2	---	---	211
50	---	---	---	14	9/69	500	23.5	4	50	6.4	212
220	36	6	122;157;176; 212	113	7/73	45	0.26	---	---	---	213
.50	42	6	---	38	5/73	10	0.1	---	---	---	214
.50	30	6	---	14	8/73	1	.025	---	212	---	215
50	70	6	---	1	8/73	1	0.03	---	221	---	216
.50	60	6	---	14	8/73	13	0.41	---	258	---	217
.50	50	6	---	5	8/73	20	0.94	---	163	---	218
46	46	12	---	4	3/73	477	232	5	---	5.7	219
45	45	12	---	2	3/73	86	25	5	---	5.7	220
46	46	12	---	3	3/73	525	132	5	---	5.7	221
300	70	8	---	60	8/63	56	0.92	7	215	6.5	222
270	152	8	---	25	9/63	355	6.6	9	250	6.5	223
100	51	8	65;255	17	9/70	54	1.82	7	---	---	224
28	---	6	---	10	3/62	110	5.13	6	190	6.0	225
46	92	8	---	19	1/66	200	16.7	6	200	6.0	226
87	87	6	---	12	3/74	---	---	7	215	6.0	227
'05	---	8	---	0	12/68	390	2.78	67	3750	6.5	228
'50	---	8	---	---	5/70	350	2.76	6	195	6.0	229
00	46	6	48;71;156	22	3/74	183	8.8	7	---	---	230
90	---	8	---	40	3/74	---	---	---	---	---	231
55	48	8	295	1	3/74	30	---	---	850	---	232
31	15	12	---	7	5/73	150	21.4	---	---	---	233
00	44	8	---	12	6/65	30	0.11	---	---	---	234
00	39	8	63	30	6/65	20	0.12	---	---	---	235
00	20	8	---	10	6/65	140	0.93	---	---	---	236
60	20	6	---	95	9/73	12	0.18	---	---	---	237
20	25	6	---	50	8/73	6	.085	---	---	---	238
44	92	5	130	120	4/74	---	---	---	---	---	239
50	---	5	---	100	4/74	---	---	---	---	---	240
25	45	6	---	67	4/74	4	---	---	---	---	241
65	40	6	---	0	4/74	8	0.11	10	230	7.0	242
50	86	8	37;350	2	4/68	24	0.46	---	---	---	243
80	---	6	---	13	7/74	10	1	5	180	6.0	244
40	---	6	---	2	7/74	---	---	6	150	6.25	245
05	---	6	---	11	7/74	10	11.8	5	190	5.75	246
40	---	6	---	11	10/75	8	12.5	5	190	5.75	247
86	---	8	---	9	10/75	17	0.45	5	210	6.75	248

TABLE 10.

Well location: Number	Well location: Lat-Long	Owner	Driller	Date completed	Use	Altitude of land surface (feet)	Topographic setting	Aquifer/ lithology
Ly- 249	4115-7643	Hughesville Bor.	Layne-New York Co., Inc.	1872	P	585	V	Qal/sg
250	4107-7701	U. S. Geol. Survey	Germania Well Drilling Co.	1974	U	560	W	Sto/ls
251	4109-7701	John Pryor	do.	1974	H	820	S	Sr/sh
252	4114-7700	Lycoming County Govt.	do.	1969	Z	525	V	Oo/ls
253	4116-7702	Williamsport Area Sch. Dist.	do.	1973	Z	635	S	Olh/ss
254	4116-7702	do.	do.	1973	T	635	S	Olh/ss
255	4114-7659	Syntex Fabrics Inc.	do.	1974	N	535	V	Oon/sh
256	4114-7654	Williamsport Newcrete Co.	do.	1972	N	520	V	Qal/sg
257	4113-7710	Harvest Moon Trailer Ct.	do.	1972	C	580	S	Oml/sh
258	4117-7703	Stroehmann Bakery	do.	1963	N	570	V	Olh/st
259	4117-7703	First Hartford Realty Corp.	do.	1973	U	565	V	Olh/st
260	4117-7703	do.	do.	1973	C	565	V	Qal/sg
261	4120-7656	Carl Henry	---	---	H	860	S	Ock/st
262	4124-7653	Robert Blair	C. S. Garber & Sons, Inc.	1974	H	865	V	Dck/st
263	4110-7713	Donald Cameron	do.	1975	U	570	V	Sr/sh
264	4107-7712	Thomas Hinaman	do.	1974	H	790	S	Olh/ls
265	4109-7708	Rose Stopper	do.	1975	H	900	S	Oro/ls
266	4109-7656	Fed. Bur. of Prisons	---	1943	P	610	S	Oml/sh
267	4109-7755	do.	---	---	U	660	S	Oml/sh
268	4112-7643	Gordon Hill	Gordon E. Hill	1972	H	560	S	Oml/ls
269	4110-7652	Montgomery Mills Inc.	---	---	U	505	V	Oml/sh
270	4110-7650	Grumman Allied Industries	Wieand Brothers	1972	Z	510	V	Oml/sh
271	4110-7650	do.	do.	1972	U	510	V	Oml/sh
272	4112-7655	Pa. Dept. of Transp.	E. W. Artley	1947	P	2000	H	Oj/st
273	4111-7649	Koppers Company Inc.	Wieand Brothers	1971	F	505	V	OSk/ls
274	4111-7649	do.	do.	1971	U	505	V	Oo/ss
275	4111-7649	do.	do.	1971	H	505	V	Oo/sh
276	4111-7649	do.	do.	1971	H	505	V	Oo/ss
277	4111-7649	do.	William Cresswell	1972	U	505	V	Oo/ss
278	4111-7649	do.	do.	1972	N	505	V	Oo/ss
279	4114-7655	Carey McFall Company	---	---	U	530	V	Sto/ls
280	4114-7655	do.	---	---	N	535	V	Sto/ls
281	4110-7651	do.	Wieand Brothers	1971	Z	510	V	Oml/sh
282	4111-7649	Construction Specialties Inc.	Germania Well Drilling Co.	1968	N	530	S	Sb/sh
283	4112-7646	Bryfogle Nurseries	do.	---	I	518	V	Sto/ls
284	4112-7646	Bryfogle's Inc.	do.	1968	I	520	V	Sto/ls
285	4112-7646	Bryfogle Nurseries	do.	1973	I	500	V	Sto/ls
286	4112-7646	do.	do.	1972	U	525	V	OSk/ls
287	4114-7650	GTE Sylvania	Sprague & Henwood, Inc.	1958	N	540	S	Sto/ls
288	4114-7650	do.	Layne-New York Co., Inc.	1966	N	540	S	Sto/ls
289	4114-7653	Pa. Power and Light Co.	---	1970	N	560	W	Sto/ls
290	4114-7653	do.	---	---	U	560	S	Sto/ls
291	4114-7651	Eck's Garage	Germania Well Drilling Co.	1973	C	660	S	Omr/sh
292	4114-7653	Lycoming Silica Sand Co.	Merle C. Wishard	1960	H	525	V	Sb/sh
293	4113-7645	do.	---	---	H	550	V	Sto/ls
294	4113-7645	H. W. Fry	---	---	U	530	V	Sto/ls
295	4115-7656	Williamsport Country Club	Germania Well Drilling Co.	1968	H	610	S	Oml/sh
296	4115-7656	do.	C. W. Yarrison	1958	H	585	S	Oml/sh
297	4115-7656	do.	do.	1956	I	560	S	Oo/ss
298	4114-7657	do.	---	---	U	575	S	Oo/ls
299	4115-7656	do.	---	---	U	595	S	Oml/sh
300	4115-7643	Hughesville Bor.	George Turner	1957	U	590	V	Ob/sh
301	4113-7647	Muncy Bor. Water Auth.	Harrisburg's Kohl Bros.	1975	S	480	V	Qal/sg
302	4112-7647	Sprout Waldron & Co.	George Turner	1960	N	505	V	Swc/sh
303	4112-7647	do.	do.	1972	N	500	V	Swc/sh
304	4112-7647	do.	do.	1971	N	505	V	Swc/sh
305	4114-7643	---	Gordon E. Hill	1974	H	570	V	Qal/sg
306	4114-7644	Robert Geedes	do.	1973	H	570	V	Omr/sh
307	4113-7642	Lynn Lunger	do.	1971	H	595	V	Omt/ls
308	4113-7644	Food Rite	do.	1971	H	550	V	Omr/sh
309	4112-7643	Marshall Hull	do.	1971	C	545	V	Oml/sh
310	4112-7643	do.	do.	1972	P	550	V	Oml/sh
311	4112-7644	Ivan Kepner	do.	1972	H	515	V	Oml/sh
312	4112-7643	Raymond Clayton	do.	1969	H	615	S	Qal/sg
313	4111-7645	James Devore	do.	1972	H	620	S	Oml/sh
314	4114-7645	Charles Lowe	do.	1974	H	600	S	Oo/ss
315	4114-7646	Harry Richart	do.	1972	H	610	S	Oo/ss
316	4113-7646	Charles Lowe	do.	1971	H	535	V	Qal/sg
317	4114-7646	Leonard Klees	do.	1973	H	580	H	Sto/ls
318	4111-7646	Grace Baptist Ch.	do.	1974	H	560	S	Oo/ss

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Total depth below land surface (feet)	Casing		Depth(s) to water-bearing zone(s) (feet)	Static water level		Reported yield (gpm)	Specific capacity (gpm/ft)	Hard-ness (gpg)	Specific conduc-tance (micro-mhos at 25°C)	pH	Well number
	Depth (feet)	Diameter (inches)		Depth below land surface (feet)	Date measured (mo/yr)						
49	39	16	---	10	10/72	450	39	2	105	6.0	Ly- 249
409	168	6	---	16	9/74	21	3.55	15	500	7.25	250
100	50	6	---	F	3/75	10	0.14	4	140	7.0	251
126	110	8	---	24	7/69	220	23	9	430	7.0	252
400	33	8	---	100	8/73	34	0.37	2	280	7.3	253
400	23	8	---	100	8/73	29	0.29	2	280	7.3	254
136	57	8	---	---	---	35	---	---	---	---	255
53	53	8	---	32	6/72	60	---	---	---	---	256
188	23	10	---	20	10/72	128	2.57	---	---	---	257
124	61	8	---	14	6/63	200	7.41	7	450	7.2	258
185	70	6	---	10	3/73	41	---	---	---	---	259
40	40	10	---	9	3/73	200	61	5	295	6.0	260
110	---	6	---	---	---	---	---	2	60	5.0	261
183	24	6	40;120	3	4/75	5	0.20	---	8500	---	262
127	26	6	115	3	7/75	5	0.18	13	4100	8.10	263
360	40	6	---	118	7/75	20	0.23	27	700	8.0	264
320	235	6	280;314	210	4/75	3	0.03	---	---	---	265
300	---	8	---	+3	7/75	200	29	6	210	7.5	266
300	---	8	---	26	7/75	17	0.56	5	220	7.0	267
150	50	6	---	35	9/72	---	---	6	275	7.1	268
400	---	6	---	5	8/75	42	0.44	---	---	---	269
327	52	6	55;70;90	18	8/75	17	0.51	2	220	7.0	270
302	50	6	52;100;150	18	8/75	11	0.22	---	400	---	271
57	50	6	---	31	8/75	---	---	4	775	6.0	272
325	53	6	---	25	3/71	177	3.52	21	1050	7.5	273
109	41	8	---	20	8/75	19	1.62	7	260	7.25	274
103	41	6	---	25	7/71	20	---	10	400	7.0	275
90	41	8	---	18	8/75	150	---	7	270	7.5	276
63	40	8	---	20	8/75	2	0.08	7	265	7.5	277
141	44	8	---	12	5/72	128	8.15	8	245	7.25	278
87	---	6	---	28	8/75	---	---	---	---	---	279
200	---	8	---	53	8/75	70	2.8	12	500	7.5	280
203	29	6	---	9	8/75	100	3.7	5	230	7.0	281
250	43	8	---	25	4/68	100	1.78	4	175	6.5	282
100	---	---	---	---	---	120	---	25	---	---	283
111	92	8	---	15	11/73	60	---	16	640	7.5	284
75	79	8	---	8	9/75	---	---	19	850	7.5	285
102	58	10	---	26	9/75	22	5.79	6	220	7.5	286
215	66	10	---	45	6/74	244	14.4	34	1100	7.75	287
212	60	10	---	55	6/74	265	14.3	44	1650	8.0	288
358	---	---	---	45	9/75	---	---	9	330	7.0	289
75	---	6	---	45	9/75	---	---	---	250	---	290
200	---	6	---	45	10/75	21	---	5	195	6.5	291
55	---	6	---	26	10/75	8	0.38	10	460	6.8	292
120	---	6	---	57	10/75	12	0.88	8	320	7.0	293
52	---	6	---	35	10/75	8	1.16	11	340	7.0	294
80	50	6	---	---	---	---	---	4	140	6.70	295
80	---	6	---	---	---	---	---	3	120	6.2	296
286	50	8	---	46	3/77	240	9.0	5	165	7.0	297
100	---	8	---	64	10/75	3	0.13	9	340	7.0	298
65	---	6	---	8	10/75	22	2.2	2	80	6.2	299
148	70	8	---	14	10/75	22	4.62	5	380	7.0	300
38	21	12	---	12	9/76	350	52.7	---	---	---	301
135	40	---	60	---	---	60	---	32	1080	7.4	302
175	31	---	60;175	---	---	45	---	---	---	---	303
145	40	---	---	---	---	50	---	---	---	---	304
38	38	6	---	5	4/74	---	---	---	---	---	305
57	57	6	---	---	---	24	---	---	---	---	306
50	27	6	---	12	12/71	36	9.0	---	---	---	307
92	58	6	---	10	4/71	15	0.25	---	---	---	308
128	84	6	95;118	14	8/71	24	0.43	---	---	---	309
200	92	6	125;185	15	10/72	12	0.01	---	---	---	310
90	29	6	63;84	7	8/72	12	0.18	---	---	---	311
100	100	6	---	70	5/69	24	2.4	---	---	---	312
100	62	6	69;94	36	7/72	20	0.83	---	---	---	313
105	74	6	---	50	---	---	---	---	---	---	314
82	42	6	---	52	1/72	20	2.86	---	---	---	315
79	79	6	---	40	6/71	24	2.0	---	---	---	316
170	74	6	---	55	11/73	---	---	---	---	---	317
50	24	6	---	22	4/74	24	---	---	---	---	318

TABLE 10.

Well location								
Number	Lat-Long	Owner	Driller	Date completed	Use	Altitude of land surface (feet)	Topographic setting	Aquifer/ lithology
Ly- 319	4110-7711	Mike Persun	Trego Bros.	1976	H	1190	S	Or/sg
320	4114-7649	Lycoming Mall	Harrisburg's Kohl Bros.	1976	U	535	S	Osk/ls
321	4114-7703	Eastern Scrap Co.	C. S. Garber & Sons, Inc.	1974	C	535	V	Oml/sh
322	4110-7706	Terry Gamble	do.	1975	H	1590	H	Obe/ss
323	4111-7715	---	---	---	---	560	V	Omr/sh
324	4112-7712	---	---	---	H	535	V	Qal/sg
325	4112-7714	---	---	---	H	540	V	Qal/sg
326	4110-7710	David Huling	C. S. Garber & Sons, Inc.	1974	H	1180	S	Or/sh
327	4109-7710	P. C. Brumgard	New Way Drilling Inc.	1976	H	1050	S	Oa/sh
328	4108-7706	K. E. Lynn	C. S. Garber & Sons, Inc.	1976	H	1500	S	Oj/ss
329	4107-7711	Charles Schultz	do.	1974	H	850	S	Os/ls
330	4108-7706	Williamsport Water Auth.	do.	1974	H	1500	S	Obe/ss
331	4107-7709	Lincoln Spring Hunt Club	do.	1974	H	1535	S	Obe/ss
332	4107-7712	John Surfield	do.	1974	H	900	S	Oa/sh
333	4108-7710	Clyde Herter	do.	1975	H	805	S	Olh/ls
334	4109-7710	Limestone Twp.	do.	1976	H	835	S	Osn/ls
335	4107-7712	Charles Wirth	do.	1973	H	780	V	Olh/ls
336	4107-7712	Donald Delaney	do.	1973	H	840	S	Os/ls
337	4109-7659	Gary Baker	Gordon E. Hill	1972	H	585	V	Sto/ls
338	4118-7645	Albert Safuce	Max A. Lundy	1968	H	1170	S	Ock/sh
339	4119-7706	Laverne Fry	do.	1968	H	650	S	Olh/sh
340	4116-7714	Miles Eck	Harris W. Barto	1969	H	730	S	Ock/sh
341	4115-7713	Ira Hanley	Germania Well Drilling Co.	1966	H	640	S	Olh/sh
342	4118-7713	R. E. Bean	C. S. Garber & Sons, Inc.	1974	H	800	V	Ock/sh
343	4115-7713	Donald Thomas	do.	1974	H	780	H	Ock/sh
344	4116-7712	Daniel Hartrauft	do.	1974	H	880	V	Ock/sh
345	4115-7709	Haven Homes Inc.	do.	1974	H	900	V	Ock/sh
346	4116-7708	D. G. Mays	do.	1974	H	640	S	Olh/st
347	4119-7659	Sheppard	Max A. Lundy	1969	H	900	S	Ock/sh
348	4113-7702	John Steinbacker	C. S. Garber & Sons, Inc.	1975	H	580	S	Sm/sh
349	4113-7656	John Polcym	do.	1973	H	620	S	Sm/sh
350	4112-7707	Lorson and Lorson	New Way Drilling Inc.	1976	H	600	S	Swc/sh
351	4112-7704	Richard Sullivan	C. S. Garber & Sons, Inc.	1974	H	1300	S	Obe/ss
352	4111-7705	T. M. Paternostro	do.	1976	H	1550	H	Obe/ss
353	4110-7706	Richard Ranich	do.	1975	H	1565	S	Obe/ss
354	4110-7708	N. A. Bower	do.	1973	H	1240	S	Or/sh
355	4110-7656	Paul Staggert	Gordon E. Hill	1972	H	680	H	Qal/sg
356	4109-7658	Gary Baker	do.	1972	H	640	S	Swc/st
357	4107-7659	Harry Burrows	Robert H. Zimmerman	1970	H	585	S	Sto/ls
358	4110-7710	Andre Delgalvis	C. S. Garber & Sons, Inc.	1976	H	1335	S	Obe/ss
359	4110-7706	George Baier	do.	1976	H	1140	S	Or/sh
360	4110-7657	Miller and Rodgers	do.	1975	H	650	H	Oo/ls
361	4110-7657	James Womeldolf	Wieand Brothers	1976	H	660	H	Oo/ls
362	4109-7657	Miller and Rodgers	C. S. Garber & Sons, Inc.	1975	H	670	H	Oo/ls
363	4109-7654	Litchard Motel	Gordon E. Hill	1975	H	725	H	Omt/ls
364	4111-7649	Robert Steel	Wieand Brothers	1975	H	550	S	Swc/st
365	4111-7652	Shuler and Alder Homes	do.	1972	H	640	S	Sto/ls
366	4111-7653	Ronald Cross	do.	1976	H	665	S	Swc/st
367	4111-7651	Percy Brouss	---	---	H	535	S	Osk/ls
368	4110-7652	D and B Body Shop	Germania Well Drilling Co.	1965	H	520	S	Oml/sh
369	4120-7657	Melvin Bennett	Max A. Lundy	1968	H	810	V	Ock/sh
370	4119-7656	Sidney Gear	do.	1968	H	760	S	Ock/sh
371	4119-7656	Bill Ungard	do.	1968	H	935	S	Olh/sh
372	4118-7656	Robert Lunt	do.	1968	H	700	S	Olh/sh
373	4120-7655	A. Orick	Wieand Brothers	1975	H	630	V	Qal/sg
374	4120-7655	D. A. Bruder	New Way Drilling Inc.	1976	H	620	V	Qal/sg
375	4118-7658	Robert Bucher	Wieand Brothers	1975	H	820	S	Olh/---
376	4119-7658	Haven Homes Inc.	C. S. Garber & Sons, Inc.	1976	H	880	S	Olh/sh
377	4117-7658	Gordon Hiller	do.	1975	H	820	S	Olh/sh
378	4116-7651	H. S. Nole	Merle C. Wishard	1972	H	915	S	Ob/st
379	4115-7653	R. P. Maxwell	New Way Drilling Inc.	1976	H	710	S	Ob/sh
380	4119-7651	Darryl Walter	C. S. Garber & Sons, Inc.	1976	H	1120	H	Ock/ss
381	4116-7649	Robert Mowery, Jr.	do.	1974	H	1040	S	Olh/sh
382	4119-7653	Louis Colehuff	do.	1975	H	720	S	Olh/sh
383	4117-7654	Paul Smolinsky	New Way Drilling Inc.	1976	H	565	V	Olh/sh
384	4117-7653	John Harvey	Wieand Brothers	1975	H	595	V	Olh/ss

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Total depth below land surface (feet)	Casing: Depth (feet)	Casing: Diameter (inches)	Depth(s) to water-bearing zone(s) (feet)	Static water level: Depth below land surface (feet)	Static water level: Date measured (mo/yr)	Reported yield (gpm)	Specific capacity (gpm/ft)	Hardness (gpg)	Specific conductance (micromhos at 25 C)	pH	Well number
360	83	6	200	75	11/76	2	0.01	---	---	---	Ly- 319
150	50	6	65;135	30	10/76	200	200	---	---	---	320
160	46	6	---	13	7/74	20	0.31	---	---	---	321
100	20	6	80;90	55	5/75	20	0.50	1	55	6.5	322
112	---	---	---	---	---	---	---	9	---	---	323
33	---	---	---	---	---	---	---	2	---	6.0	324
33	---	---	---	30	11/41	---	---	---	---	---	325
85	79	6	80	15	6/74	100	1.42	---	---	---	326
140	65	6	---	65	9/76	12	0.16	---	---	---	327
180	92	6	148;167	81	5/76	20	0.20	---	---	---	328
320	195	5	185;275;310	200	5/74	20	0.17	---	---	---	329
140	47	6	89;110;135	55	7/74	15	0.18	---	---	---	330
220	21	6	---	140	3/74	5	0.06	---	---	---	331
260	41	6	220;243	185	5/74	9	0.11	---	---	---	332
210	153	6	205	115	10/75	60	0.63	---	---	---	333
230	172	6	230	170	5/76	60	1.00	---	---	---	334
197	130	6	85;185	85	12/73	7	0.06	---	---	---	335
248	80	6	180;225	160	4/73	5	0.06	---	---	---	336
79	41	6	24;66	16	3/72	24	1.60	---	---	---	337
235	22	6	---	130	10/68	20	0.29	---	---	---	338
91	38	6	60;85	35	6/68	5	0.10	---	---	---	339
30	11	6	---	4	10/69	4	0.20	---	---	---	340
126	24	6	---	50	7/66	5	0.07	---	---	---	341
60	21	6	40;57	20	7/74	30	0.75	---	---	---	342
400	20	6	130;380	130	5/74	3	0.10	---	---	---	343
200	26	6	80;150	20	8/74	1	0.01	4	225	7.2	344
300	42	6	42;180	35	3/74	1	.004	---	---	---	345
280	20	6	100;240	40	12/74	1	.004	---	---	---	346
90	30	6	70;85	35	3/69	7	0.16	---	---	---	347
180	82	6	120;151;175	60	7/75	30	0.25	---	---	---	348
200	169	6	180;190	100	9/73	12	0.12	---	---	---	349
125	108	6	120	65	8/76	8	0.13	---	---	---	350
140	31	6	80;108	F	1/74	10	0.07	---	---	---	351
400	20	6	100;355;370;386	230	4/76	2	0.01	---	---	---	352
180	24	6	86;173	100	6/75	5	0.06	---	---	---	353
260	108	6	180;230	20	12/73	1	.004	---	---	---	354
80	80	6	---	35	4/72	24	2.0	---	---	---	355
79	41	6	51;66	16	3/72	24	1.60	---	---	---	356
110	105	6	---	46	7/70	45	2.65	---	---	---	357
160	86	6	145	50	8/76	15	0.14	---	---	---	358
80	48	6	60	32	8/76	30	0.63	---	---	---	359
160	67	6	100;127;154	50	6/75	12	0.12	---	---	---	360
223	164	6	180;209	60	8/76	30	---	---	---	---	361
140	24	6	100;127;135	83	12/75	30	0.53	---	---	---	362
105	40	6	95	---	---	---	---	---	---	---	363
123	70	6	82;108	---	7/75	100	---	---	---	---	364
122	106	6	110	---	6/72	30	---	---	---	---	365
148	99	6	128	---	9/76	45	---	---	---	---	366
63	40	6	---	10	---	---	---	---	---	---	367
70	65	6	---	F	9/65	30	---	---	---	---	368
60	12	6	19;40;55	19	3/68	20	0.77	---	---	---	369
90	12	6	70;85	30	8/68	15	0.38	---	---	---	370
110	50	6	85;98	40	8/68	5	0.08	---	---	---	371
142	46	6	90;120;130	45	8/68	5	0.06	---	---	---	372
101	86	6	86	---	---	100	---	---	---	---	373
80	80	6	---	23	11/76	30	0.53	3	140	5.0	374
98	37	6	62;73;80	---	---	15	---	---	---	---	375
120	42	6	97;105	40	4/76	6	0.08	---	---	---	376
300	49	6	115;197	105	11/75	3	0.02	---	---	---	377
130	32	6	80	40	1/72	6	0.12	---	---	---	378
160	46	6	105;138	50	9/76	20	0.18	---	---	---	379
260	21	6	220;265	180	6/76	8	0.10	---	---	---	380
220	21	6	170;195;198	70	9/74	8	0.05	---	---	---	381
260	28	6	193;250	55	8/75	6	0.03	---	---	---	382
100	60	6	80	---	---	10	---	---	---	---	383
148	42	6	105	---	---	25	---	---	---	---	384

TABLE 10.

Well location: Number	Well location: Lat-Long	Owner	Driller	Date completed	Use	Altitude of land surface (feet)	Topographic setting	Aquifer/ lithology
Ly- 385	4119-7654	Charles Winner	Wieand Brothers	1975	H	640	S	Dlh/---
386	4118-7646	Walter Baxter	Merle C. Wishard	1971	H	1090	S	Dck/sh
387	4119-7647	Ronald Hall	Gordon E. Hill	1973	H	1065	H	Dck/sh
388	4117-7645	Albeit Safdle	Max A. Lundy	1968	H	1130	S	Dck/sh
389	4114-7647	Jacob Gehron	Gordon E. Hill	1973	H	535	V	Don/ls
390	4111-7647	Earl Barto	do.	1972	H	620	H	Dml/sh
391	4113-7646	Dale Bontomase	do.	1972	H	510	V	Swc/sh
392	4111-7642	---	do.	1972	---	550	V	Dtr/sh
393	4112-7646	Paul Fogelman	do.	1975	H	495	V	Swc/st
394	4114-7649	Sam Fry	do.	1976	H	585	S	Dml/sh
395	4114-7645	Ben Stopper	do.	1975	H	675	H	Dml/sh
396	4114-7643	Stanley Lore	Merle C. Wishard	1971	H	575	V	Dml/sh
397	4114-7648	James Gleason	Gordon E. Hill	1975	H	550	V	Swc/sh
398	4120-7655	Joe Krifchik	Max A. Lundy	1969	H	630	V	Mp/sh
399	4117-7701	Ron Fullenton	C. S. Garber & Sons, Inc.	1974	H	1020	H	Dlh/sh
400	4118-7703	Gerald Andrus	do.	1974	H	820	S	Dck/ss
401	4118-7701	Darrel Steinback	do.	1974	H	1020	S	Dlh/ss
402	4119-7704	David Hurme	do.	1975	H	870	S	Dlh/sh
403	4119-7703	Walter Vaneman	do.	1974	H	890	S	Dck/ss
404	4118-7704	Morman Ch.	do.	1974	H	660	S	Dck/ss
405	4116-7701	William Hoffman	do.	1973	H	740	S	Dlh/sh
406	4116-7700	Larry Harer	New Way Drilling Inc.	1976	H	1010	H	Dlh/sh
407	4116-7700	M. K. Beckett	C. S. Garber & Sons, Inc.	1976	H	1030	H	Dlh/sh
408	4117-7701	John Speaker	do.	1974	H	850	S	Dlh/sh
409	4117-7701	Jerry French	do.	1974	H	840	S	Dlh/sh
410	4118-7705	Robert Smith	New Way Drilling Inc.	1976	H	995	S	Dck/sh
411	4115-7703	David Hepler	C. S. Garber & Sons, Inc.	1976	H	705	H	Db/sh
412	4115-7702	John Kennedy	do.	1975	H	550	V	Qal/sg
413	4115-7703	Margret Boerkoel	Andrew E. Trautner	1973	H	560	V	Db/sh
414	4116-7704	Haven Homes Inc.	C. S. Garber & Sons, Inc.	1975	H	950	H	Dlh/sh
415	4115-7705	J. F. Lowe, Jr.	do.	1976	H	860	H	Dlh/sh
416	4116-7705	Haven Homes Inc.	New Way Drilling Inc.	1976	H	920	S	Dlh/ss
417	4110-7714	do.	C. S. Garber & Sons, Inc.	1975	H	680	S	Sb/sh
418	4111-7711	Virginia Hartzel	do.	1974	H	535	V	Qal/sg
419	4112-7711	Michael Borowski	do.	1974	H	660	V	Dh/sh
420	4113-7713	Dad's	do.	1974	C	565	V	Db/sh
421	4113-7709	Larry Brooks	do.	1975	H	560	V	Dml/sh
422	4113-7712	Frederick Nelson	do.	1975	H	840	S	Dlh/sh
423	4113-7713	Donald McBride	Frank Copenhaver	1975	H	645	S	Dck/sh
424	4114-7715	Raymond Prince	New Way Drilling Inc.	1976	H	1160	S	Dlh/sh
425	4113-7708	Frank Skvarka	C. S. Garber & Sons, Inc.	1974	H	630	S	Db/sh
426	4115-7708	Leroy Hughes	do.	1974	H	640	S	Dlh/sh
427	4114-7708	John Williams	do.	1975	H	600	S	Dlh/sh
428	4115-7707	H. W. Wiston	do.	1976	H	960	S	Dlh/sh
429	4112-7706	Harry Panning	do.	1976	H	780	S	Sr/ss
430	4112-7706	Lecce Housing Co.	do.	1975	H	650	S	Qal/sg
431	4112-7706	Dale Singer	do.	1973	H	690	S	Sb/sh
432	4112-7707	Thomas Mosier	do.	1974	H	660	S	Sb/st
433	4113-7717	William Fidler	Harris W. Barto	1967	H	680	V	Dlh/sh
434	4113-7715	Donald Shermory	C. S. Garber & Sons, Inc.	1974	H	690	S	Dlh/sh
435	4112-7717	John Daugherty	do.	1974	H	775	S	Dlh/sh
436	4111-7716	Glenn Luse	do.	1974	H	610	V	Do/ss
437	4108-7701	John Budman	Wieand Brothers	1976	H	645	S	Sto/ls
438	4108-7700	Frank Dyer	do.	1975	H	620	S	Do/ss
439	4108-7701	John Bower	do.	1976	H	640	V	Sb/sh
440	4109-7700	William Hetner	do.	1975	H	600	S	Swc/st
441	4112-7643	Fred Nicewinter	Gordon E. Hill	1971	H	550	V	Dmt/ls
442	4116-7648	William Trimble	do.	1971	H	810	S	Dlh/ss
443	4117-7713	H. L. Barton	Germania Well Drilling Co.	1964	H	780	S	Dck/st
444	4112-7643	Delbert Coslett	Gordon E. Hill	1971	H	550	V	Qal/sg
445	4119-7652	Irvin Davis	do.	1972	H	870	V	Dck/ss
446	4118-7652	Wilfrer Camp, Jr.	do.	1971	H	1070	S	Dlh/ss
447	4114-7716	Albert Brown	Harris W. Barto	1969	H	1020	S	Dlh/sh
448	4116-7655	Lycoming County Home	C. W. Yarrison	1936	U	625	S	Db/st
449	4116-7655	do.	---	---	U	680	S	Dlh/sh
450	4117-7713	Salladasburg Lumber Co.	---	1957	U	685	V	Dck/---
451	4121-7653	Robert Thomas	Max A. Lundy	1968	H	665	V	Qal/sg
452	4113-7659	Edith Yahner	Wieand Brothers	1976	H	690	V	Oj/st
453	4111-7654	Deluxe Motel and Restaurant	---	---	P	705	S	Sb/sh
454	4112-7702	Steven Conner	Germania Well Drilling Co.	1970	H	690	V	Oa/sh

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otal lepth elow and rface eet)	Casing Depth (feet)	Casing Diameter (inches)	Depth(s) to water-bearing zone(s) (feet)	Static water level: Depth below land surface (feet)	Static water level: Date measured (mo/yr)	Reported yield (gpm)	Specific capacity (gpm/ft)	Hard-ness (gpg)	Specific conduc-tance (micro-mhos at 25°C)	pH	Well number
398	65	6	---	---	---	1	---	---	---	---	Ly- 385
155	48	6	105;150	30	4/71	6	---	3	160	6.3	386
195	9	6	142;186	135	3/73	12	0.57	---	---	---	387
235	22	6	180;205;230	130	10/68	15	0.25	---	---	---	388
110	33	6	42;93	4	1/73	20	0.34	---	---	---	389
137	24	6	64	22	5/72	5	0.05	---	---	---	390
54	42	6	41	27	6/72	24	3.00	---	---	---	391
120	61	6	102	8	3/72	6	0.06	---	---	---	392
65	30	6	48;56	---	8/75	40	---	---	---	---	393
165	41	6	46;61;120	---	---	33	---	---	---	---	394
170	46	6	121	---	---	5	---	---	---	---	395
70	51	6	60	20	8/71	12	0.67	---	---	---	396
110	70	6	86	---	---	---	---	---	---	---	397
44	39	6	43	23	5/69	30	6.00	---	---	---	398
160	36	6	90;118;148	90	7/74	6	0.09	---	---	---	399
230	42	6	100;215	90	9/74	12	0.09	---	---	---	400
120	25	6	75;112	55	7/74	25	0.36	---	---	---	401
300	26	6	115;225	205	10/75	2	0.02	---	---	---	402
200	42	6	100;137;196	100	9/74	5	0.05	---	---	---	403
280	54	6	192;226;242	45	10/74	8	0.03	---	---	---	404
300	20	6	80	27	7/73	1	.004	---	---	---	405
480	21	6	---	320	9/76	1	.006	---	---	---	406
180	31	6	55;167	40	7/76	4	0.03	---	---	---	407
160	21	6	52;92	16	7/74	6	0.04	---	---	---	408
200	25	6	90;132:193	35	7/74	6	0.04	---	---	---	409
260	28	6	70;170	77	5/77	2	0.01	3	100	6.4	410
400	23	6	140	130	3/76	1	.004	---	---	---	411
35	35	6	---	18	10/75	20	1.18	---	---	---	412
106	42	6	80;95	15	7/73	15	---	---	---	---	413
180	41	6	115;170	90	5/75	5	0.06	---	---	---	414
120	23	6	80;114	52	4/76	12	0.18	---	---	---	415
100	43	6	80	75	11/76	60	2.40	---	---	---	416
200	86	6	195	14	5/75	60	0.33	---	---	---	417
57	57	6	---	20	6/74	30	1.11	---	---	---	418
100	27	6	40;75	30	6/74	8	0.11	---	---	---	419
160	33	6	40;148;152	40	11/74	30	0.25	18	750	7.5	420
200	32	6	60;97;140	9	6/75	2	0.01	---	---	---	421
200	26	6	100;117	40	8/75	2	0.01	---	---	---	422
88	13	6	30;82	44	11/75	9	0.26	---	---	---	423
160	41	6	100	90	9/76	5	0.07	---	---	---	424
140	25	6	100;130	30	3/74	6	0.05	---	---	---	425
140	21	6	50;111	30	11/74	5	0.05	---	---	---	426
100	23	6	60;72;91	36	6/75	10	0.16	---	---	---	427
160	22	6	100;148	70	5/76	20	0.22	---	---	---	428
220	125	6	160;213;215	56	7/76	12	0.07	---	---	---	429
132	129	6	126	55	3/75	60	0.78	---	---	---	430
180	81	6	100;170	100	8/73	9	0.05	---	---	---	431
202	161	6	---	55	8/74	100	0.68	---	---	---	432
59	21	6	51;56	1	5/67	18	0.45	---	---	---	433
280	25	6	90;212;245	40	7/74	4	0.02	---	---	---	434
170	38	6	74;130;163	30	9/74	25	0.18	---	---	---	435
100	73	6	80;87;95	65	11/74	20	0.57	---	---	---	436
198	61	6	148;173	40	11/76	9	0.06	---	---	---	437
223	103	6	205	---	---	20	---	---	---	---	438
98	21	6	68	---	---	25	---	---	---	---	439
123	50	6	82;115	---	---	15	---	---	---	---	440
85	40	6	57	20	10/71	10	0.17	---	---	---	441
152	18	6	35;110	45	11/71	4	0.04	---	---	---	442
165	---	6	---	---	---	100	---	4	220	7.4	443
31	31	6	---	17	12/71	12	2.00	---	---	---	444
84	23	6	41;64	0	5/72	5	0.06	---	---	---	445
100	95	6	98	35	9/71	6	0.10	---	---	---	446
126	21	6	68;92	69	6/69	1	0.02	---	---	---	447
295	32	8	---	60	---	12	0.24	---	---	---	448
350	62	6	---	70	---	20	---	---	---	---	449
---	---	---	---	---	---	---	---	---	---	---	450
102	105	6	---	25	7/68	20	4.0	---	---	---	451
148	100	6	105;121	20	2/76	30	0.25	---	---	---	452
96	---	6	---	---	---	---	---	4	140	7.0	453
70	---	5	---	2	5/77	25	---	1	380	7.2	454

TABLE 10.

Well location: Number	Well location: Lat-Long	Owner	Driller	Date completed	Use	Altitude of land surface (feet)	Topographic setting	Aquifer/ lithology
Ly- 455	4112-7702	Ray McCarroll	Germania Well Drilling Co.	1966	H	675	V	Oa/sh
456	4108-7701	Russell Budman	George Turner	1964	H	630	S	Swc/st
457	4108-7701	Charles Ulrich	Robert H. Zimmerman	1954	H	644	S	Sb/sh
458	4118-7705	Bill McQuown	Andrew E. Trautner	1976	H	995	S	Dck/sh
459	4118-7705	Sharron Featherstone	do.	1977	H	940	S	Dck/sh
460	4118-7706	Ernest Kinley	do.	1975	H	960	S	Dck/sh
461	4119-7701	Richard Sechrist	do.	1976	H	900	S	Dck/sh
462	4119-7701	Patricia Knight	do.	1976	H	960	S	Dck/sh
463	4119-7649	Ray Dincher	Max A. Lundy	1973	H	1025	S	Dck/sh
464	4118-7649	Terry Dincher	do.	1970	H	965	S	Dck/sh
465	4118-7649	Susan Eldred	do.	1976	H	1160	S	Dck/sh
466	4118-7648	Earl Hall	George Turner	1961	H	1055	S	Dck/sh
467	4116-7709	Raymond Jackson	Andrew E. Trautner	1957	H	790	V	Dck/sh
468	4117-7710	Dodge	do.	1965	H	970	S	Dck/sh
469	4117-7710	Floyd Koch	Germania Well Drilling Co.	1975	H	950	S	Dck/sh
470	4117-7707	Larry Hostrander	do.	1976	H	1000	H	Dck/sh
471	4117-7709	J. A. Ertel	do.	1965	H	845	V	Dlh/st
472	4117-7710	Bernard Bower	Andrew E. Trautner	1970	Z	1220	S	Dck/sh
473	4118-7708	H. J. Gunther	do.	1965	H	960	V	Dlh/st
474	4119-7708	Dan Stabler	do.	1973	H	850	V	Dck/sh
								CLINTON
Cn- 60	4108-7714	Ralph Barger	C. S. Garber & Sons, Inc.	1973	H	775	V	Ol/ls
62	4111-7717	Jersey Shore Water Co.	---	1940	P	550	V	Qal/sg
63	4111-7717	do.	Layne-New York Co., Inc.	1964	Z	551	V	Qal/sg
69	4111-7717	do.	---	1955	P	550	V	Qal/sg
89	4110-7718	Jersey Shore Steel Co.	Germania Well Drilling Co.	1964	N	550	V	Qal/sg
90	4110-7718	do.	C. S. Garber & Sons, Inc.	1974	N	555	V	Do/ss
91	4112-7719	G. F. Nelson	Harris W. Barto	1966	H	570	V	Qal/sg
92	4112-7718	Daniel Todd	do.	1966	H	570	V	Dlh/sh
93	4107-7716	Lloyd Welshans	do.	1966	H	930	S	Oc/ls
94	4107-7716	Kenneth Miller	Max A. Lundy	1966	H	970	S	Oa/ls
95	4108-7714	James Hager	George Turner	1967	H	770	S	Ol/ls
96	4110-7717	---	---	---	H	550	V	Dml/sh
								NORTHUMBERLAND
Nu- 12	4106-7646	Berrizi Bros. Silk Mill	Kohl Bros., Inc.	---	I	550	V	DSk/ls
17	4108-7653	W. E. Dutler	Clarence A. Grove	---	H	440	V	Dml/sh
18	4106-7652	Dairyman Coop. Assoc.	---	---	U	480	V	Sto/ls
19	4106-7652	Dewart Milk Products Co.	Kohl Bros., Inc.	1918	N	485	V	Swc/---
109	4109-7648	Otis Flynn	George Turner	1967	H	730	S	Dtr/sh
110	4108-7653	T. W. Fogelman, Sr.	Germania Well Drilling Co.	---	S	485	V	Qal/sg
111	4108-7653	do.	J. M. York	1954	H	490	V	Dml/sh
112	4108-7653	do.	Germania Well Drilling Co.	---	H	475	V	Qal/sg
113	4107-7650	J. A. Habig	R. R. Hornberger	1972	H	505	V	Don/ls
114	4106-7650	James Calabro	Wieand Brothers	1974	H	585	H	Sto/ls
115	4108-7652	Robert Ranck	Gilbert R. Zechman	1976	H	600	H	Dml/sh
116	4108-7652	Dewart Constr. Co.	do.	1976	H	615	H	Dml/sh
117	4106-7653	Delaware Twp. Munic. Auth.	Wieand Brothers	1975	H	470	V	Swc/sh
118	4108-7645	Frank Hans	R. R. Hornberger	1966	H	805	S	Dmt/ls
119	4109-7646	Cline Hoffman	Gordon E. Hill	1968	H	1010	H	Dtr/st
120	4106-7648	Yoder Brothers	R. R. Hornberger	1968	H	575	H	Sto/ls
121	4108-7650	Edward Sherman	Robert H. Zimmerman	1966	H	605	S	Dml/sh
122	4107-7650	George Dentler	---	1968	H	540	S	Dmr/sh
123	4106-7649	John Furgesen	R. R. Hornberger	1967	H	570	H	DSk/ls
124	4110-7646	Muncy Bor.	---	---	U	700	V	Dtr/st
125	4108-7648	R. L. Harris	Wieand Brothers	1976	H	730	S	Dml/sh
126	4106-7646	Lester Miller	R. R. Hornberger	1968	H	565	S	Dmr/sh
								UNION
Un- 71	4106-7654	Mrs. O. W. Foresman	Wieand Brothers	1974	U	500	S	Sto/ls
72	4106-7653	do.	do.	1974	U	473	W	Sto/ls
73	4106-7653	do.	do.	1974	U	480	W	DSk/ls
74	4107-7654	do.	do.	1974	U	485	S	DSk/ls
75	4107-7654	do.	do.	1974	U	490	S	DSk/ls

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otal epth elow and rface eet)	Casing Depth (feet)	Casing Diameter (inches)	Depth(s) to water-bearing zone(s) (feet)	Static water level Depth below land surface (feet)	Static water level Date measured (mo/yr)	Reported yield (gpm)	Specific capacity (gpm/ft)	Hardness (gpg)	Specific conductance (micromhos at 25°C)	pH	Well number
57	37	6	48	3	5/76	22	---	9	280	7.2	Ly- 455
135	40	6	---	55	6/73	21	---	7	245	6.95	456
110	20	8	105	21	4/74	40	---	6	250	6.9	457
200	19	6	---	46	5/77	10	---	3	50	6.25	458
115	---	8	---	---	---	8	---	2	55	6.1	459
175	25	8	---	90	5/77	32	---	6	240	6.7	460
148	22	6	---	78	5/77	7	---	5	150	7.05	461
190	110	6	165	29	5/77	10	---	4	140	6.9	462
125	100	6	---	65	5/75	---	---	2	100	6.4	463
65	25	6	---	35	4/72	5	---	2	90	6.2	464
400	40	6	---	126	5/77	10	---	1	180	8.1	465
235	25	8	---	---	---	10	---	4	160	6.7	466
85	---	8	---	3	---	---	---	4	245	6.9	467
250	---	8	---	50	5/77	---	---	---	---	---	468
109	25	6	---	8	---	25	---	5	190	6.9	469
300	20	6	---	59	7/76	3	---	6	325	7.0	470
78	12	8	15;74	5	8/65	30	3	6	325	6.95	471
430	15	6	---	10	5/77	---	---	1	520	9.25	472
110	30	6	---	---	---	11	---	5	200	6.6	473
60	30	5	---	15	5/76	3	---	6	305	7.2	474
UNTY											
200	143	5	---	110	8/73	12	0.27	10	270	6.5	Cn- 60
47	41	12	---	15	11/42	350	22	---	---	---	62
48	---	8	---	25	12/64	108	10.3	6	250	7.0	63
36	20	96	---	19	8/74	180	17	9	---	---	69
126	103	10	---	34	8/65	250	15.2	---	---	---	89
220	153	8	---	---	---	500	---	11	445	6.7	90
36	36	6	---	18	8/66	26	6.5	---	---	---	91
55	46	6	46;50	8	10/66	7	0.18	---	---	---	92
77	30	6	68;74	27	9/66	6	0.15	---	---	---	93
292	12	6	220;250;285	150	9/66	5	0.04	---	---	---	94
195	91	6	---	110	11/67	7	---	---	---	---	95
60	46	6	---	---	---	---	---	9	---	7.9	96
UNTY											
196	30	6	---	F	---	17	---	20	---	---	Nu- 12
87	46	---	---	27	10/30	6	---	---	---	---	17
465	---	---	---	20	---	150	---	---	---	---	18
210	---	6	---	75	---	---	---	20	---	---	19
216	11	6	113	---	---	2	---	---	---	---	109
41	---	6	---	17	11/75	30	---	1	165	6.5	110
215	55	6	---	19	11/75	10	0.05	3	220	7.0	111
36	36	6	---	12	11/75	30	---	4	170	6.5	112
350	20	6	---	F	3/72	20	0.07	---	---	---	113
123	50	6	97;104	30	5/74	15	0.16	---	---	---	114
397	97	6	170;370	200	11/76	2	---	---	---	---	115
251	105	6	153;240	80	11/76	6	0.04	---	---	---	116
73	37	6	46	20	1/75	50	0.94	---	---	---	117
275	23	6	71;180;217	110	5/66	2	0.01	---	---	---	118
310	8	6	302	165	1/68	10	0.07	---	---	---	119
125	120	6	122	62	2/68	30	3.75	---	---	---	120
122	---	6	98;117	20	12/66	23	0.23	---	---	---	121
105	---	6	103	40	7/68	6	0.09	---	---	---	122
184	34	6	178	60	8/67	50	0.40	---	---	---	123
75	---	6	---	F	3/74	1	---	2	75	---	124
173	20	6	157	40	7/76	40	0.30	---	---	---	125
53	33	6	34	28	3/68	4	0.14	---	---	---	126
UNTY											
575	180	6	540	20	2/74	305	5.8	87	1800	6.5	Un- 71
339	87	6	40;70;95;128;250	2	1/74	323	25.6	8	2500	7.0	72
463	60	6	---	15	1/74	275	12.4	22	---	---	73
400	82	6	---	6	1/74	380	---	---	---	---	74
464	192	6	37;100;200;230;255;290;300;345;385	1	2/74	275	4.5	22	435	---	75

TABLE 10

Well location		Owner	Driller	Date completed	Use	Altitude of land surface (feet)	Topographic setting	Aquifer/litholog
Number	Lat-Long							
Un- 76	4107-7654	Mrs. D. W. Foresman	Wieand Brothers	1974	U	525	S	Do/ls
77	4107-7654	Mrs. Evelyn Finck	do.	1974	U	575	H	Do/ls
78	4107-7653	Mrs. D. W. Foresman	do.	1974	U	480	S	Do/ls
79	4106-7755	Spring Garden Market	---	---	H	485	V	Sto/ls
80	4107-7754	Earl Beck	---	---	H	520	S	DSk/ls
81	4107-7755	White Deer Baptist Ch.	---	---	H	525	S	DSk/ls
82	4107-7754	Fabric Ctr.	---	---	H	605	H	Do/ls
83	4106-7754	B. H. Buss	---	---	H	555	V	Swc/st
84	4106-7754	S. W. Reid	---	---	H	515	V	Sto/ls
85	4106-7655	Devitt Home	R. R. Hornberger	1966	H	650	S	Sr/sh
86	4106-7654	Kenneth Miller	Robert H. Zimmerman	1967	H	490	V	Sb/sh
87	4107-7657	F. D. Riesle	do.	1967	H	490	V	Sto/ls
88	4106-7653	J. S. Ravert	do.	1966	P	480	V	Sb/sh
89	4106-7654	Donnley Fisher	do.	1966	H	515	V	Sto/ls
90	4108-7657	Pa. Game Comm.	Gilbert R. Zechman	1970	P	630	S	Dmr/sh

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otal depth below and rface (feet)	Casing		Depth(s) to water-bearing zone(s) (feet)	Static water level		Reported yield (gpm)	Specific capacity (gpm/ft)	Hard-ness (gpg)	Specific conduc-tance (micro-mhos at 25 C)	pH	Well number
	Depth (feet)	Diameter (inches)		Depth below land surface (feet)	Date measured (mo/yr)						
396	125	6	95;105;130;270;395	37	2/74	100	---	55	---	7.0	Un- 76
548	92	6	50;110;115;170;200;470;520	86	2/74	165	---	69	1600	6.5	77
547	69	6	340;350;385;515;545	52	5/74	85	---	---	5900	---	78
---	---	6	---	---	---	---	---	13	350	---	79
---	---	---	---	---	---	---	---	19	580	---	80
---	---	---	---	---	---	---	---	14	375	---	81
---	---	---	---	---	---	---	---	14	375	---	82
---	---	---	---	---	---	---	---	4	150	---	83
---	---	---	---	---	---	---	---	8	260	---	84
415	82	7	110;150;171;212;270;388;405	0	10/66	150	0.38	---	---	---	85
170	21	6	110;162	31	4/67	5	0.04	---	---	---	86
85	27	6	73	22	11/67	45	4.50	---	---	---	87
125	57	6	80;118	39	12/66	26	6.50	---	---	---	88
84	53	6	59;79	57	11/66	22	7.33	---	---	---	89
275	65	6	185;245	34	3/70	20	0.69	7	---	---	90

TABLE 11. RECORD OF SELECTED SPRINGS

Location: Lat-long, latitude and longitude, in degrees and minutes, of the southeast corner of a 1-minute quadrangle within which the spring is located.
Use: H, household; P, public supply; U, unused.
Aquifer: Sr, Rose Hill Formation; St, Tuscarora Formation; Oro, Rodman Formation.
Discharge: E, estimated; M, measured; R, reported.
Temperature: °C, degrees Celsius.

Spring number	Location (lat-long)	Owner/ Name of spring	Use	Altitude of land surface (feet)	Aquifer	Yield Discharge (gallons per minute)	Date	Temper-ature (°C)	Hardness (grains per gallon)	Specific conduc-tance (micromhos at 25°C)	pH
Ly-Sp-1	4109-7713	Clyde Carpenter/Nippeno Spring	U	640	Oro	66,300 M	3/77	7.5	4	145	7.0
2	4113-7657	Montoursville Municipal Water Works	P	850	St	200 E	2/59	---	---	---	5.9
3	4113-7656	Montoursville Borough	P	681	St	---	---	---	---	---	6.5
4	4112-7650	Pennsylvania State Correctional Institution for Women	P	740	Sr	500 R	10/63	---	1	---	6.2
5	4113-7703	---	H	580	Sr	20 M	10/75	11	2	65	---
6	4110-7700	---	H	1010	St	11 M	10/75	10	1	25	---

TABLE 12. CHEMICAL ANALYSES OF GROUNDWATER

(Quantities are in milligrams per liter unless otherwise indicated)

Number of well or spring	Date of collection	Field temperature (°C)	Silica (SiO_2)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3) as N	Orthophosphate (PO_4) as P	Dissolved solids		Hardness as $CaCO_3$		Alkalinity as $CaCO_3$	pH (field)	Specific conductance (micromhos at 25°C)	Analysis source[b]	Trace element analysis
																Method unknown	Residue on evaporation at 180°C	Noncarbonate	Calcium-magnesium					
QUATERNARY ALLUVIUM																								
Ly- 26	2-18-71	--	--	1.3[a]	0.0	11.2	--	--	--	--	32.5	10	0.0	--	--	82	--	--	34	16	--	--	GF	--
	9-08-71	14.4	--	.40[a]	.0	18.4	--	--	--	--	39	13	--	--	--	146	--	--	56	28	--	--	GF	--
51	2-18-71	--	--	.10	.0	8.8	--	--	--	--	19	7	.0	--	--	38	--	--	28	8	--	--	GF	--
	1-07-72	--	--	.15	.0	16.8	--	--	--	--	34	14	--	--	--	92	--	--	50	20	--	--	GF	--
68	2-18-71	--	--	.10	.0	13.6	--	--	--	--	25	12	.0	--	--	66	--	--	44	20	--	--	GF	--
	1-07-72	--	--	.08	.0	20.0	--	--	--	--	42	20	--	--	--	136	--	--	66	26	--	--	GF	--
84	2-18-71	--	--	.10	.0	16.0	--	--	--	--	34.5	10	.0	--	--	76	--	--	52	16	--	--	GF	--
	1-07-72	--	--	.08	.0	24	--	--	--	--	44	16	--	--	--	146	--	--	74	22	--	--	GF	--
89	7-25-35	--	6.6	.01	--	8.6	1.8	3.1	0.7	19	10	4.1	.0	1.2	--	--	53	--	29	--	--	--	USGS	--
99	3-16-77	10.5	5.5	.0	.0	10	2.3	4.0	.6	18	9.4	8.6	.0	1.3	0.06	--	65	20	35	15	6.1	120	USGS	Yes
120	3-30-77	11.5	5.5	.01	.0	42	7.0	6.6	.7	47	44	19	.1	3.9	.01	166	--	96	130	39	6.7	320	USGS	Yes
121	5-03-73	--	--	.10	.0	--	--	--	--	--	53	20	.0	.0	--	232	--	--	146	42	--	--	S	--
122	5-03-73	--	--	.15	.0	--	--	--	--	--	44	42	.0	1.4	--	292	--	--	166	46	--	--	S	--
125	12-65	--	--	5.6[a]	.23[a]	--	--	--	--	--	--	13	--	--	--	--	--	104	136	106	--	--	LNY	--
126	12-65	--	--	12[a]	.30[a]	--	--	--	--	--	--	29	--	--	--	140	--	--	--	84	--	--	LNY	--
178	3-16-77	12	5.3	.83[a]	.01	15	3.3	2.4	1.1	16	20	7.1	.0	2.5	.03	--	93	38	51	13	5.5	158	USGS	Yes
183	9-08-71	16.7	--	.22	.0	12.8	--	--	--	--	27	10	--	--	--	100	--	--	42	26	--	--	GF	--
	1-07-72	--	--	.05	.0	20.8	--	--	--	--	45	22	--	--	--	142	--	--	70	24	--	--	GF	--
184	5-04-71	6.7	--	.07	.0	20	--	--	--	--	43.5	18	--	--	--	136	--	--	66	24	--	--	GF	--
	9-08-71	17.8	--	.23	.0	12.8	--	--	--	--	28	11	--	--	--	88	--	--	40	18	--	--	GF	--
185	2-18-71	--	--	.07	.0	17.6	--	--	--	--	29.5	12	.0	--	--	76	--	--	54	20	--	--	GF	--
	1-07-72	--	--	.10	.0	6.4	--	--	--	--	11.0	3	--	--	--	40	--	--	20	16	--	--	GF	--
211	5-28-64	--	3	.09	--	12	1.9	--	--	--	0	6	--	--	--	92	--	--	38	26	--	--	S	--
212	3-16-77	11	6.9	.03	.0	16	4.7	2.0	.6	39	14	4.7	.0	.99	.01	--	84	27	59	32	6.4	138	USGS	Yes
219	3-21-73	--	--	<.1	0	--	--	--	--	--	45	15	--	--	--	--	--	--	80	40	5.7	--	POOT	--
220	3-01-73	--	--	<.1	0	--	--	--	--	--	50	15	--	--	--	--	--	--	90	30	5.7	--	POOT	--
221	3-30-73	--	--	<.1	0	--	--	--	--	--	45	20	--	--	--	--	--	--	90	50	5.7	--	POOT	--
233	12-18-74	--	--	.87[a]	0	38.3	11.9	--	--	--	49.4	14.6	0	3.02	--	282	--	--	145	116	--	--	S	--
249	11-06-72	--	--	.05	.0	28	--	4	--	--	9	9	.0	.51	--	--	57	15	36	--	--	--	BGB	--
260	3-21-73	--	--	.20	--	20	5.5	--	--	--	29	17	--	.0	--	--	--	--	72	20	--	--	S	--
301	9-24-75	--	--	.01	0	28.9	7.3	--	--	--	31	15	0	1.53	--	192	--	--	102	66	--	--	J	--
374	3-15-77	10.5	5.7	.11	.04	11	3.0	2.2	1.2	15	8.2	9.3	.0	4.8	.02	--	90	28	40	12	5.0	140	USGS	Yes

TABLE 12. (CONTINUED)

Number of well or spring	Date of collection	Field temperature (°C)	Silica (SiO_2)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3) as N	Orthophosphate (PO_4) as P	Dissolved solids: Method unknown	Dissolved solids: Residue on evaporation at 180°C	Hardness as $CaCO_3$: Noncarbonate	Hardness as $CaCO_3$: Calcium-magnesium	Alkalinity as $CaCO_3$	pH (field)	Specific conductance (micromhos at 25°C)	Analysis source[b]	Trace element analysis
QUATERNARY ALLUVIUM																								
Cn- 62	9-08-54	--	--	.05	--	--	--	--	--	--	4	--	0	.3	--	115	--	--	92	43	--	--	USGS	--
63	3-16-77	12	7.6	.01	.0	34	5	6	2	66	26	14	.1	3.8	.09	--	162	52	110	--	7.0	250	USGS	Yes
CATSKILL FORMATION																								
Ly- 112	11-17-71	11	9.4	0.29	0.07[a]	44	3.5	6.7	1.4	65	11	45	0.0	2.7	0.15	--	186	71	125	--	--	308	USGS	--
204	3-14-77	12	12	.04	.0	47	12	21	1.4	79	1.3	90	.0	7.0	.02	--	309	100	170	65	7.1	510	USGS	Yes
261	3-14-77	9.5	7.2	.12	.01	5.5	2.2	3.0	.9	14	2.6	4.5	.0	3.9	.01	--	59	11	23	11	6.1	90	USGS	Yes
262	3-10-75	--	--	--	--	--	--	--	.16	111	18	2800[a]	.39	.03	--	--	--	--	457	96	--	6032	USGS	--
344	3-14-77	10.5	9.6	.09	.0	18	6.0	14	.9	90	9.5	7.0	.1	1.7	.02	--	123	0	70	74	7.2	225	USGS	Yes
386	3-15-77	10.0	12	.03	0	19	3.1	3.7	.5	59	2.3	4.0	.1	2.7	.02	--	95	12	61	48	6.3	160	USGS	Yes
443	3-14-77	10.5	11	.05	.01	22	4.2	6.6	.8	58	.1	14	.1	5.6	.03	--	130	25	72	48	7.4	189	USGS	Yes
LOCK HAVEN FORMATION																								
Ly- 166	3-15-77	9.5	13	.15	.07[a]	18	5.6	20	.5	122	9.0	1.3	.2	.01	.02	--	131	0	69	100	7.2	245	USGS	Yes
180	3-15-77	12.5	7.5	.74[a]	.10[a]	13	3.6	15	.9	39	11	26	.1	1.6	.01	--	107	16	48	32	6.5	205	USGS	Yes
253	7-16-73	--	--	.57[a]	.0	18.4	6	--	--	--	16	5	--	.05	--	148	--	--	70	78	--	--	S	--
	3-15-77	13	13	.10	.02	5.1	1.5	48	.4	102	18	8.7	.2	.16	.04	--	156	0	19	84	7.1	280	USGS	Yes
258	3-14-77	13	12	2.0[a]	.44[a]	38	7.0	14	.5	116	19	29	.1	.0	.01	--	215	29	120	95	7.2	325	USGS	Yes
BRALLIER FORMATION																								
Ly- 179	3-15-77	12.0	13	.11	.04	22	5.0	17	.4	117	7.3	4.9	.1	.02	.01	--	135	0	77	96	7.8	240	USGS	Yes
420	3-16-77	11.5	18	.56[a]	.91[a]	96	24	18	.7	117	9.4	210	.1	.03	.01	--	516[a]	240	340	96	7.5	850	USGS	Yes
TRIMMERS ROCK FORMATION																								
Ly- 230	1-03-67	--	13	2.0[a]	.1[a]	25.5	13.0	--	--	--	76	13.0	--	--	--	--	260	--	116	70	--	--	S	--

HARRELL FORMATION																							
Ly- 215	8-08-73	--	--	10.0[a]	.05	--	--	--	--	--	35	.0	.0	--	--	260	--	--	--	72	--	--	S	Yes
	6-28-74	--	--	10.5[a]	.02	--	--	--	--	--	44	7.0	.1	--	--	146	--	--	--	64	--	--	S	Yes
216	8-07-73	--	--	--	--	--	--	--	--	--	100	--	.0	--	--	--	--	--	--	96	--	--	S	Yes
	6-28-74	--	--	4.3[a]	.0	--	--	--	--	--	41	.0	.1	--	--	148	--	--	--	68	--	--	S	Yes
MAHANTANGO FORMATION																							
Ly- 109	7-25-35	11.7	--	.20	--	80	12	6	--	220	65	10	.0	.02	--	--	282	--	249	--	--	--	USGS	--
217	8-07-73	--	--	.67[a]	.0	--	--	--	--	--	14	.0	.0	--	--	88	--	--	--	138	--	260	S	--
218	8-06-73	--	--	.3	.0	--	--	--	--	--	10	.0	.0	--	--	90	--	--	--	84	7.4	160	S	--
222	8-15-73	--	--	.05	0	15.3	4.9	--	--	--	0	.6	0	.05	--	172	--	--	58	117	--	--	J	--
224	10-07-70	--	--	.17	0	31.4	8.3	--	--	--	0	1.6	0	0	--	--	--	--	113	136	--	--	J	--
226	1-07-66	--	9.1	.28	<.1	18.1	5.9	--	--	--	5.9	0	--	--	--	184	--	--	70	84	--	--	S	--
266	3-15-77	11.5	16	.24	.13[a]	25	5.8	5.5	.2	98	8.5	1.7	.1	.0	.03	--	125	7	87	80	8.0	180	USGS	Yes
268	3-16-77	12.0	12	.01	.01	33	7.5	6.4	.5	106	21	3.7	.2	1.1	.01	--	157	27	110	87	7.1	275	USGS	Yes
269	9-12-66	--	12	2.5[a]	--	124	40	--	--	--	390[a]	282[a]	--	--	--	--	--	--	--	109	--	--	HT	--
MARCELLUS FORMATION																							
Un- 90	3-19-70	--	--	.35[a]	0.0	43.2	4.0	--	--	--	7.0	1.0	--	--	--	162	--	--	124	124	--	--	S	--
Ly- 158	3-15-77	11.5	18	.42[a]	.08[a]	13	2.8	4.4	.3	59	7.5	1.0	0.1	0.04	0.01	--	82	0	44	48	7.6	120	USGS	Yes
ONONOAGA FORMATION																							
Ly- 223	9-25-63	--	--	.1	0	21.8	6.0	--	--	--	12.8	1.7	0	0	--	244	--	--	79	114	--	--	J	--
OLO PORT FORMATION																							
Cn- 90	3-15-77	12.5	9.4	.08	.06[a]	56	11	4.8	.8	140	71	7.9	.1	1.3	.03	--	264	73	190	--	6.7	445	USGS	--
Un- 76	5-24-74	12	--	--	--	--	--	--	--	--	929[a]	--	--	--	--	--	2580[a]	--	1419	--	7.3	3100	USGS	--
	2-28-74	--	--	--	--	170	67.5	--	--	--	420[a]	375[a]	.1	--	--	1518[a]	--	--	950	416	--	--	S	--
77	2-11-74	10.5	--	2.8[a]	.0	147	25.2	--	--	--	700[a]	395[a]	.2	--	--	2060[a]	--	--	1180	124	--	--	S	--
82	2-19-74	--	--	.3	.0	--	--	--	--	--	29	26	0.0	--	--	340	--	--	238	156	--	--	S	--
Ly- 228	3-16-77	13.5	9.7	.36[a]	.04	290	100	290	2.0	110	1100[a]	470[a]	1.0	.32	.01	--	2530[a]	1100	1200	90	7.0	3220	USGS	Yes
	12-05-68	--	--	.15	--	170	--	--	--	--	170	68	--	.8	--	512[a]	--	--	300	82	--	--	S	--
229	3-16-77	12	7.0	0	0	23	5.2	5.5	.4	63	28	7.0	.1	1.9	.01	--	121	28	79	52	7.0	185	USGS	Yes
	5-07-70	11.7	--	.10	--	19.8	--	--	--	--	12	4.5	0	.4	--	120	--	--	66	50	--	--	S	--
278	12-06-71	--	5.6	--	--	33	3.4	--	--	86	27	1.4	--	--	--	--	180	--	100	--	--	--	S	--
297	3-29-77	12.5	13	1.5[a]	.08[a]	20	1.8	2.6	.3	46	16	1.9	.1	.04	.01	--	94	20	57	38	6.8	165	USGS	Yes
KEYSER FORMATION																							
Un- 73	1-23-74	--	--	1.8[a]	.0	--	--	--	--	--	220	102	.0	--	--	526[a]	--	--	386	84	--	--	S	--
75	2-20-74	--	--	3.0[a]	.0	78.4	28	--	--	--	215	4	.0	--	--	418	--	--	308	108	--	--	S	-
	2-23-74	--	--	.23	.0	148	30	--	--	--	507[a]	7	.2	--	--	1004[a]	--	--	490	126	--	--	S	--
80	2-19-74	--	--	.20	.0	--	--	--	--	--	14	34	.0	--	--	500[a]	--	--	330	248	--	--	S	--
81	2-19-74	--	--	.20	.0	--	--	--	--	--	8	2	.0	--	--	286	--	--	236	206	--	--	S	--

TABLE 12. (CONTINUED)

Number of well or spring	Date of collection	Field temperature (°C)	Silica (SiO_2)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3) as N	Orthophosphate (PO_4) as P	Dissolved solids: Method unknown	Dissolved solids: Residue on evaporation at 180°C	Hardness as $CaCO_3$: Noncarbonate	Hardness as $CaCO_3$: Calcium-magnesium	Alkalinity as $CaCO_3$	pH (field)	Specific conductance (micromhos at 25°C)	Analysis source[b]	Trace element analysis
KEYSER FORMATION																								
Ly- 273	3-01-71	--	--	--	--	--	--	--	--	--	--	40	--	--	--	410	--	--	--	80	--	--	USGS	--
320	10-27-76	--	--	.81	.05	70.5	5.8	--	--	--	3.7	12.7	0	10.6[a]	--	355	--	--	300	134	--	--	J	--
TONOLOWAY FORMATION																								
Un- 71	2-25-74	--	--	.6[a]	.0	360	50	--	--	--	1063[a]	22	.4	--	--	2086[a]	--	--	1100	154	--	--	S	--
	2-27-74	--	--	.55[a]	.0	348	115	--	--	--	975[a]	23	.3	--	--	1868[a]	--	--	1330	144	--	--	S	--
72	1-31-74	--	--	.15	.0	--	--	--	--	--	1950[a]	50	.1	--	--	2570[a]	--	--	1450	142	--	--	S	--
79	2-14-74	--	--	.12	.0	--	--	--	--	--	28	3	.0	--	--	264	--	--	218	186	--	--	S	--
84	2-19-74	--	--	.15	.0	--	--	--	--	--	8	2	.0	--	--	392	--	--	140	108	--	--	S	--
Ly- 250	3-30-77	12	5.9	.57[a]	.02	56	26	1.1	.5	264	26	1.6	.2	.04	.0	--	179	30	250	220	6.7	460	USGS	Yes
280	4-24-74	--	--	<.1	--	110	56.6	--	--	--	--	--	--	--	--	290	--	--	--	--	--	--	S	--
283	8-15-73	--	--	5.5[a]	.1[a]	115	33	--	--	--	149	69	--	--	--	746[a]	--	--	430	155	--	--	POOT	--
287	6-14-74	--	--	.02	.0	--	--	6.0	--	--	549[a]	15	.0	4.0	--	--	801[a]	541	648	107	--	--	BGB	--
288	6-14-74	--	--	.02	.0	--	--	33	--	--	809[a]	28	.0	2.0	--	--	1343[a]	685	800	115	--	--	BGB	--
WILLS CREEK FORMATION																								
Un- 83	2-19-74	--	--	0.25	0.0	--	--	--	--	--	25	10	0.0	--	--	136	--	--	70	12	--	--	S	--
Ly- 302	3-30-77	--	8.6	.20	.01	130	56	7.4	1.3	107	480[a]	7.3	.1	0.02	0.01	--	769[a]	470	560	88	7.4	1080	USGS	Yes
BLOOMSBURG FORMATION																								
Ly- 282	3-30-77	13	6.5	.12	0.0	17	3.2	8.3	.8	44	18	6.9	.1	3.9	.01	--	98	20	56	36	7.0	175	USGS	Yes
ROSE HILL FORMATION																								
Ly- 251	3-15-77	11.5	8.0	.17	.07[a]	15	4.2	4.3	1.3	75	2.9	4.2	.1	.01	.01	--	107	0	55	62	7.0	140	USGS	Yes
263	7-11-75	11.5	6.7	.10	.04	68	8.6	770	16	206	12	1300[a]	1.8	.01	.01	--	2430[a]	48	220	169	--	4000	USGS	Yes

JUNIATA FORMATION																								
Ly- 196	3-15-77	8.0	2.6	4.5[a]	.04	2.3	1.7	.1	.4	23	.0	.1	.1	.0	.01	42	--	0	13	19	6.5	80	USGS	Yes
BALD EAGLE FORMATION																								
Ly- 322	3-15-77	9.0	4.8	0	.01	1.2	1.2	3.1	.7	15	.0	5.5	.0	.52	.01	31	--	0	8	12	6.5	55	USGS	Yes
REEDSVILLE FORMATION																								
Ly- 209	3-14-77	11	10	.01	.0	18	6.2	10	1.9	103	11	.8	.1	.05	.01	--	110	0	71	84	7.9	180	USGS	Yes
ANTES FORMATION																								
Ly- 182	11-09-73	12	12	.0	.0	30	15	41	1.3	227	4.8	33	.7	.53	.0	0	259	0	137	186	--	460	USGS	--
242	3-14-77	11.5	7.9	.09	0	44	1.6	1.3	.4	116	5.1	2.5	.1	3.1	.05	142	--	22	120	95	7.0	210	USGS	Yes
LINDEN HALL FORMATION																								
Ly- 198	11-28-73	12	7.4	.0	.0	61	14	2.1	1.7	214	18	16	.3	5.3	.0	--	273	34	210	176	--	450	USGS	--
210	11-29-73	11	6.5	.0	.0	86	15	3.6	1.3	316	27	6.3	.2	3.3	.0	--	338	17	277	259	--	550	USGS	--
264	3-14-77	11.5	8.1	.03	.01	72	36	3.1	1.0	307	88	2.2	.2	.74	.01	--	404	100	350	250	7.5	650	USGS	Yes
HATTER FORMATION																								
Ly- 201	11-08-73	11	10	.03	.0	170	110	3.2	1.2	161	680[a]	2.1	.2	.27	.0	--	1120[a]	745	877	132	--	1410	USGS	--
202	12-06-73	11	3.6	.03	.0	31	6.1	2.2	1.4	96	23	4.7	.2	.9	.0	--	139	23	102	79	--	220	USGS	--
BELLEFONTE FORMATION																								
Ly- 199	11-29-73	--	6.6	.01	.0	60	34	2.8	1.9	320	20	9.3	.3	9.9	.0	--	339	27	290	262	--	604	USGS	--
NIPPENO "ENCHANTED" SPRING																								
Ly-Sp-1	3-14-77	7.5	5.0	.02	0	20	3.1	3.1	.9	53	9.6	6.6	.0	.88	.01	--	92	19	63	43	7.0	145	USGS	Yes

[a]Constituent exceeds maximum concentration recommended by U. S. Environmental Protection Agency (1976).

[b]Analysis source: GF, Gannett Fleming Corddry and Carpenter, Inc.; S, Seewald Laboratories; LYN, Layne New York Drilling Co.; PDOT, Pennsylvania Department of Transportation; J, Johnson Associates Laboratories; BGB, Booth, Garrett and Blair, Inc.; H, Hungerford and Terry, Inc.; USGS, U. S. Geological Survey.

TABLE 13. TRACE ELEMENT ANALYSES OF GROUNDWATER

(Concentrations in micrograms per liter)

Well number	Date of collection	Aluminum (Al)	Arsenic (As)	Barium (Ba)	Boron (B)	Bromide (Br)	Cadmium (Cd)	Chromium (Cr)	Cobalt (Co)	Copper (Cu)	Lead (Pb)	Lithium (Li)	Mercury (Hg)	Nickel (Ni)	Selenium (Se)	Strontium (Sr)	Silver (Ag)	Zinc (Zn)	Analysis source[b]
QUATERNARY DEPOSITS																			
Cn- 63	3-16-77	0	1	100	0	100	0	<10	0	0	1	0	<0.5	3	0	120	0	20	USGS
Ly- 99	3-16-77	10	0	0	10	0	0	10	0	20	1	0	<0.5	3	1	90	0	10	USGS
120	3-30-77	0	0	0	10	0	0	<10	0	0	1	0	<0.5	2	1	500	0	120	USGS
178	3-16-77	10	0	100	0	0	0	<10	1	160	1	0	<0.5	3	0	90	0	30	USGS
212	3-16-77	0	1	0	10	0	0	10	0	0	1	0	<0.5	3	0	150	0	10	USGS
374	3-15-77	10	0	0	0	---	1	<10	0	60	16	0	<0.5	4	0	---	0	1,500	USGS
CATSKILL FORMATION																			
Ly- 204	3-14-77	0	1	200	80	300	0	<10	1	10	2	0	<0.5	5	0	180	0	40	USGS
261	3-14-77	10	0	0	0	0	0	<10	0	140	3	0	<0.5	2	0	40	0	70	USGS
344	3-14-77	10	0	0	20	0	0	<10	1	0	3	20	<0.5	4	1	110	0	150	USGS
386	3-15-77	0	3	100	0	0	0	<10	1	70	0	0	<0.5	3	0	200	0	30	USGS
443	3-14-77	10	1	0	0	0	0	<10	0	180	8	0	<0.5	5	0	70	0	150	USGS
LOCK HAVEN FORMATION																			
Ly- 166	3-15-77	0	2	200	110	0	0	10	0	0	1	20	<0.5	5	0	510	0	0	USGS
180	3-15-77	20	0	500	30	100	0	<10	1	0	2	0	<0.5	9	0	160	0	110	USGS
253	3-15-77	50	0	100	160	0	0	<10	0	120	71[a]	20	<0.5	11	0	180	0	80	USGS
258	3-14-77	10	0	600	20	100	0	<10	0	170	62[a]	10	<0.5	0	0	330	0	1,200	USGS
BRALLIER FORMATION																			
Ly- 179	3-15-77	10	0	400	40	0	0	<10	0	0	1	20	<0.5	1	0	1,300	0	0	USGS
420	3-16-77	10	0	200	20	600	0	<10	0	0	0	30	<0.5	2	0	660	0	30	USGS
HARRELL FORMATION																			
Ly- 215	6-28-74	75	---	---	---	---	---	10	---	0	---	---	---	0	---	---	---	0	S
216	6-28-74	95	---	---	---	---	---	0	---	0	---	---	---	0	---	---	---	300	S

									MAHANTANGO FORMATION										
Ly- 217	8-7-73	0	---	---	---	---	---	0	---	0	---	---	---	0	---	---	---	0	5
218	8-6-63	0	---	---	---	---	---	0	---	0	---	---	---	0	---	---	---	0	5
266	3-15-77	10	0	100	20	0	0	<10	0	0	0	10	<0.5	3	0	500	0	0	USGS
268	3-16-77	10	0	0	20	0	0	<10	1	10	2	0	<0.5	3	1	260	0	0	USGS
									MARCELLUS FORMATION										
Ly- 158	3-15-77	10	1	200	30	0	0	<10	0	0	0	10	<0.5	8	0	110	0	20	USGS
									OLD PORT FORMATION										
Ly- 228	3-16-77	10	0	100	150	600	2	10	1	10	1	40	<0.5	6	0	13,000	0	40	USGS
229	3-16-77	0	1	0	20	0	0	<10	0	0	1	0	<0.5	4	1	420	0	0	USGS
297	3-29-77	0	0	0	0	0	0	<10	1	0	1	0	<0.5	6	0	60	0	10	USGS
Cn- 90	3-15-77	0	0	100	10	0	1	10	1	0	4	10	<0.5	4	2	2,100	0	10	USGS
									TONOLOWAY FORMATION										
Ly- 250	3-30-77	20	1	100	0	0	0	<10	0	10	1	0	<0.5	3	0	60	0	10	USGS
									WILLS CREEK FORMATION										
Ly- 302	3-30-77	0	1	0	50	100	0	<10	0	10	2	20	<0.5	2	0	6,000	0	10	USGS
									BLOOMSBURG FORMATION										
Ly- 282	3-30-77	0	2	0	120	0	1	<10	2	160	74[a]	10	<0.5	3	0	460	0	620	USGS
									ROSE HILL FORMATION										
Ly- 251	3-15-77	0	4	100	30	100	34[a]	<10	0	0	2	10	<0.5	4	0	460	0	10	USGS
263	7-11-75	20	0	2,600[a]	1,100	8,000	1	<10	0	10	1	2,400	1.1	1	0	8,800	0	0	USGS
									JUNIATA FORMATION										
Ly- 196	3-15-77	0	0	200	20	0	2	<10	0	0	2	0	<0.5	4	0	30	0	5,600[a]	USGS
									BALD EAGLE FORMATION										
Ly- 322	3-15-77	10	0	0	10	0	3	<10	0	40	16	0	<0.5	6	0	30	0	3,400	USGS
									REEDSVILLE FORMATION										
Ly- 209	3-14-77	10	0	0	110	0	1	<10	0	0	12	10	<0.5	5	0	320	0	180	USGS
									ANTES FORMATION										
Ly- 242	3-14-77	20	1	0	0	0	0	<10	0	50	6	0	<0.5	3	1	350	0	0	USGS

TABLE 13. (CONTINUED)

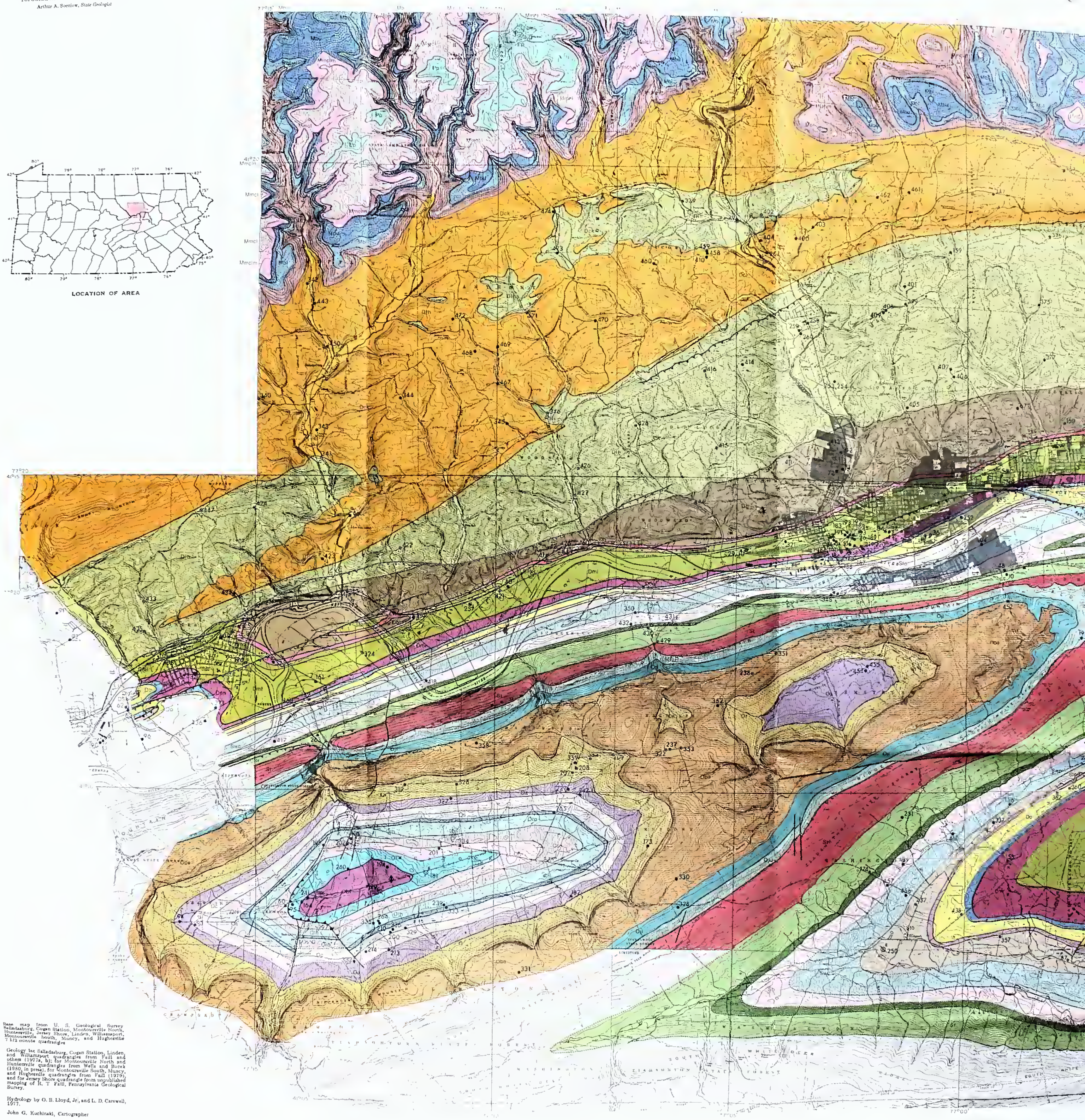
Well number	Date of collection	Aluminum (Al)	Arsenic (As)	Barium (Ba)	Boron (B)	Bromide (Br)	Cadmium (Cd)	Chromium (Cr)	Cobalt (Co)	Copper (Cu)	Lead (Pb)	Lithium (Li)	Mercury (Hg)	Nickel (Ni)	Selenium (Se)	Strontium (Sr)	Silver (Ag)	Zinc (Zn)	Analysis source[b]
LINOEN HALL FORMATION																			
Ly- 264	3-14-77	10	1	0	50	0	5	<10	0	0	9	10	<0.5	5	0	21,000	0	680	USGS
NIPPENO SPRING																			
Ly-Sp-1	3-14-77	10	1	0	0	0	2	<10	0	0	5	0	<0.5	2	0	160	0	0	USGS

[a]Constituent exceeds maximum contaminant limit set by EPA for public drinking water (U. S. Environmental Protection Agency, 1976).
[b]See explanation in Table 12.

TABLE 14. GEOPHYSICAL LOGS

Well number	Cn-63	Un-71	Un-73	Un-75	Un-76	Un-77	Un-78	Ly-112	Ly-182	Ly-187	Ly-189	Ly-190	Ly-191	Ly-192	Ly-193	Ly-202	Ly-232	Ly-236	Ly-250	Ly-262	Ly-263	Ly-267	Ly-270	Ly-271	Ly-274	Ly-297	Ly-301
Well depth, in feet	50	575	463	464	396	548	547	200	250	48	45	47	46	44	45	115	455	500	409	183	127	300	327	302	109	286	38
LOGS:																											
Temperature		X	X	X	X	X	X		X							X	X	X	X	X	X	X	X	X	X	X	
Fluid conductivity		X		X	X	X	X	X	X							X	X	X	X	X	X	X	X	X	X	X	
Caliper		X		X	X	X	X										X	X	X	X	X	X	X	X		X	
Electric	X	X		X	X	X	X	X									X	X	X	X	X	X	X	X		X	
Gamma Ray		X		X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X		X	X
Neutron										X	X	X	X	X	X				X	X		X	X			X	X
Borehole velocity		X		X	X	X	X		X								X	X	X			X	X	X		X	

TOPOGRAPHIC AND GEOLOGIC SURVEY
Arthur A. Socolow, *State Geologist*



LOCATION OF AREA

Base map from U. S. Geological Survey Salladasburg, Cogan Station, Montoursville North, Huntersville, Jersey Shore, Linden, Williamsport, Montoursville South, Muncy, and Hughesville 7 1/2 minute quadrangles

Geology for Salladasburg, Cogan Station, Linden, and Williamsport quadrangles from Faill and others (1977a, b); for Montoursville North and Huntersville quadrangles from Wells and Bucek (1980, in press); for Montoursville South, Muncy, and Hughesville quadrangles from Faill (1979), and for Jersey Shore quadrangle from unpublished mapping of R. T. Faill, Pennsylvania Geological Survey.

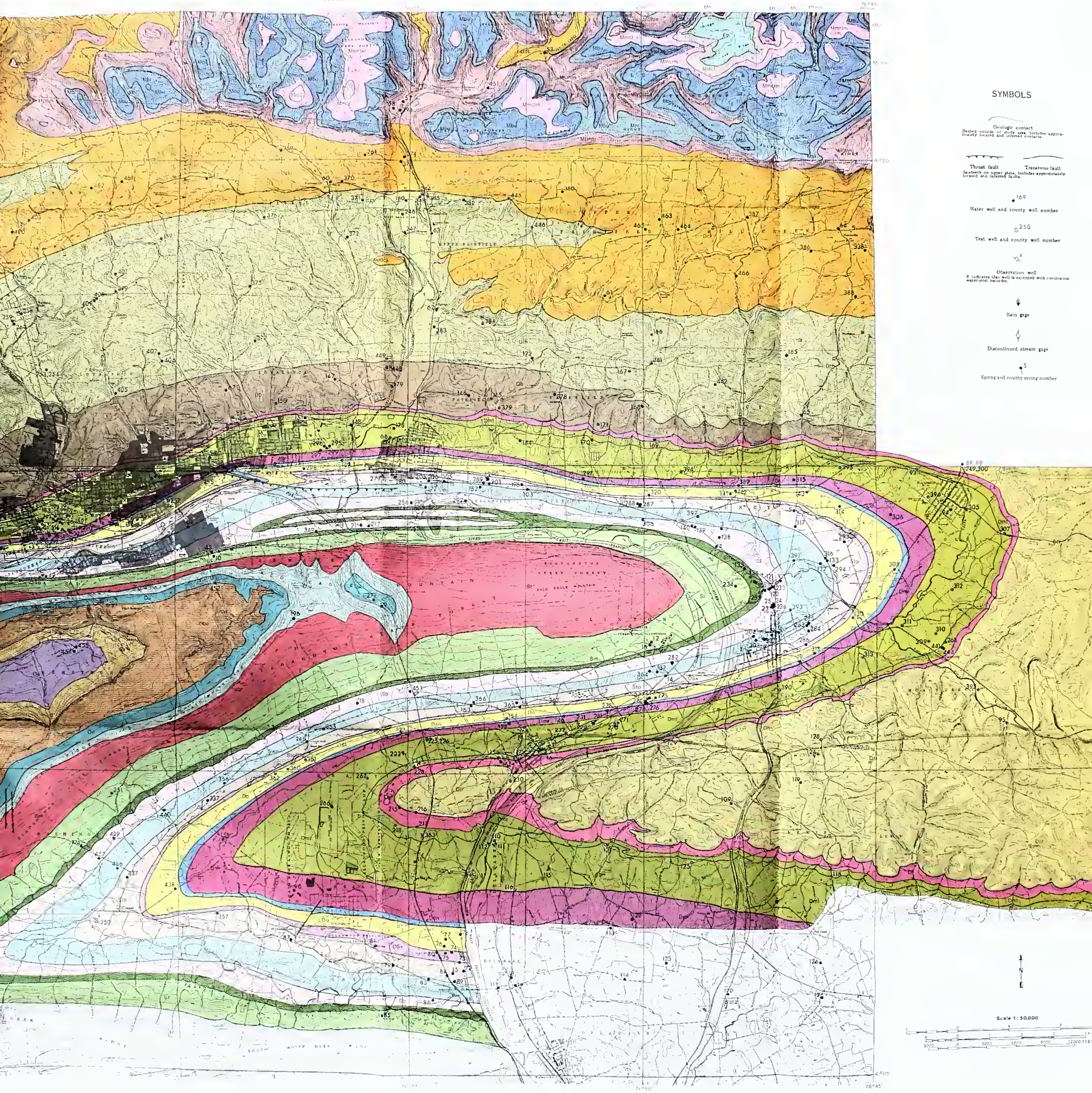
Hydrology by O. B. Lloyd, Jr., and L. D. Carswell, 1977.

John G. Kuchinski, Cartographer

PLATE 1. GEOLOGIC AND HYDROLOGIC MAP OF T

BY ORVILLE B.

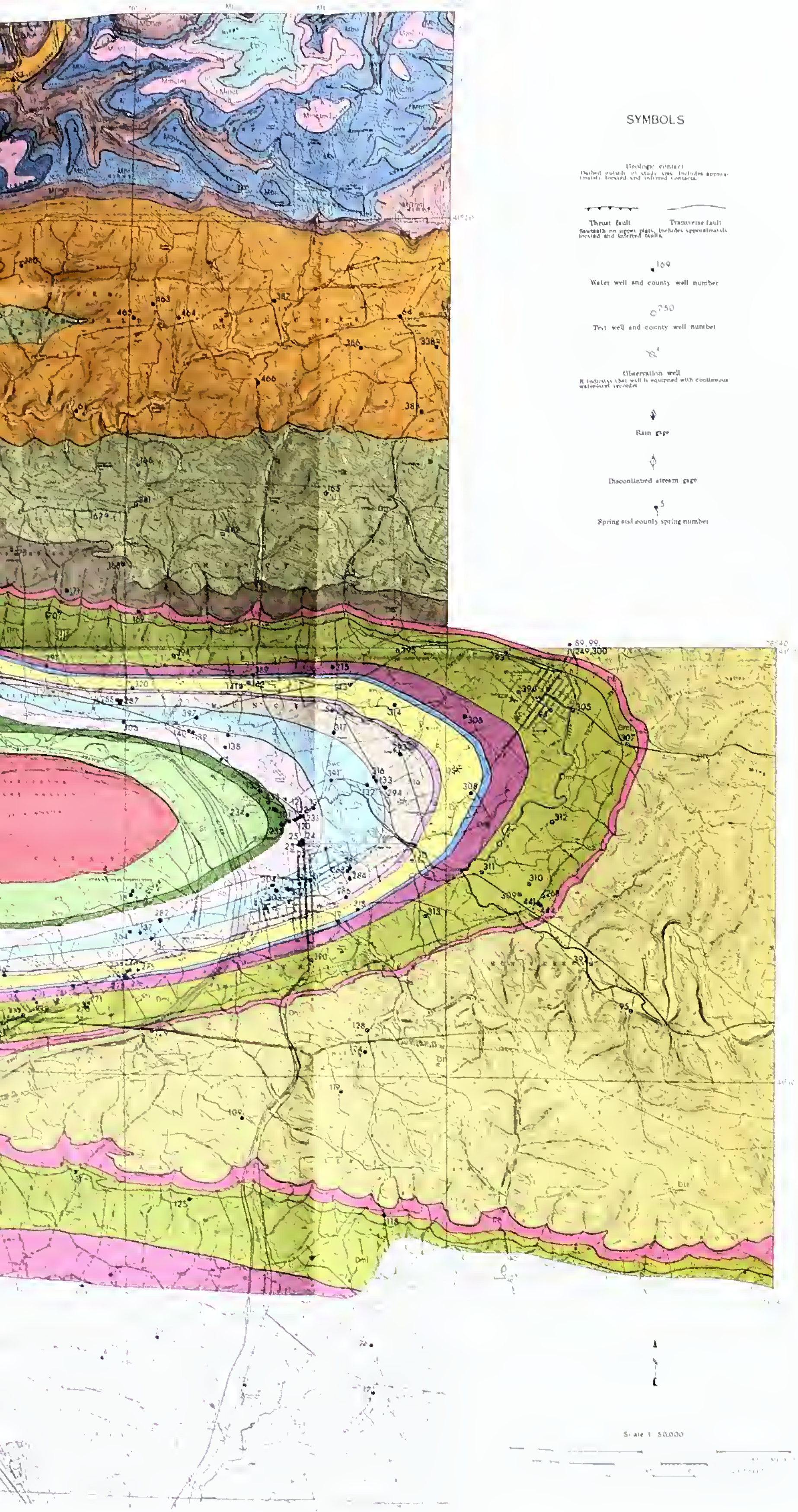
COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL RESOURCES



GEOLOGIC AND HYDROLOGIC MAP OF THE WILLIAMSPORT REGION, LYCOMING COUNTY, PENNSYLVANIA

BY ORVILLE B. LLOYD, JR., AND LOUIS D. CARSWELL

1981



LYCOMING COUNTY, PENNSYLVANIA

EXPLANATION[1]

UNCONSOLIDATED ROCKS

QUATERNARY

VALLEY FILL DEPOSITS

(See Plate 2 for thickness and distribution of valley fill deposits and locations of wells tapping these deposits.)

Poorly to well-sorted deposits of clay, silt, sand, gravel, pebbles, and boulders.

One-hour specific capacity is 2.0 (gal/min)/ft for domestic wells and 32 (gal/min)/ft for nondomestic wells, average high yield well produces 300 gal/min, maximum reported yield is 3,014 gal/min, water level is 11 feet below land surface, pH is 6.0, hardness is 5 gpg, dissolved solids is 100 mg/L, specific conductance is 150 micromhos.

CONSOLIDATED FRACTURED ROCKS

MISSISSIPPIAN AND PENNSYLVANIAN

Pp
Mmcl
Mmclm
Mbu
Mbl
MDhm

POTTSVILLE GROUP, MAUCH CHUNK FORMATION, BURGOON SANDSTONE, AND HUNTLEY MOUNTAIN FORMATION

Pottsville Group (Pp) sandstone, contains coal in places. Mauch Chunk Formation Loyalhanna Member (Mmcl)–calcareous sandstone, lower member (Mmclm)–silty shale and shaly siltstone.
Burgoon Sandstone sandstone, conglomerate at base and top. Top of lower member (Mbl) is top of prominent cliff, which is the basis for distinguishing it from upper member (Mbu).
Huntley Mountain Formation (MDhm) sandstone and a few shale interbeds.

Insufficient data for hydrologic evaluation.

DEVONIAN

Dck

CATSKILL FORMATION

Interbedded mudstone, siltstone, and sandstone, red.

One-hour specific capacity is 0.15 (gal/min)/ft for domestic wells, maximum yield reported is 180 gal/min, water level is 55 feet below land surface, pH is 6.7, hardness is 4 gpg, dissolved solids is 150 mg/L, specific conductance is 245 micromhos. Salt water was found in well Ly-262.

Dlh

LOCK HAVEN FORMATION

Interbedded siltstone, sandstone, and silty shale, olive-gray to gray. Correlates with upper part of Trimmers Rock Formation in southeastern part of area.

One-hour specific capacity is 0.08 (gal/min)/ft for domestic wells and 0.57 (gal/min)/ft for high-yield wells, average nondomestic well produces 34 gal/min, water level is 60 feet below land surface, pH is about 7.0, hardness is 4 gpg; dissolved solids is 150 mg/L, specific conductance is 245 micromhos.

Db

BRALLIER FORMATION

Interbedded siltstone and silty shale, olive-gray. Correlates with lower part of Trimmers Rock Formation in southeastern part of area.

One-hour specific capacity is 0.15 (gal/min)/ft for domestic wells, maximum yield reported is 100 gal/min, water level is 30 feet below land surface, pH is 7.4, hardness is 5 gpg, dissolved solids is 325 mg/L, specific conductance is 545 micromhos.

Dtr

TRIMMERS ROCK FORMATION

North and west of Hughesville, upper part correlates with Lock Haven Formation and lower part correlates with Brallier Formation. See description of these formations above.

One-hour specific capacity is 0.07 (gal/min)/ft for domestic wells; maximum reported yield is 165 gal/min; water level is 22 feet below land surface, pH of water from one well is 6.6; hardness is 5 gpg; dissolved solids of water from one well is 260 mg/L. See hydrology description for Lock Haven and Brallier Formations also.

Dh

HARRELL FORMATION

Shale, sooty black, fissile; massive beds.

One-hour specific capacity is 0.07 (gal/min)/ft for domestic wells; maximum yield of inventoried wells is 18 gal/min; water level is 22 feet below land surface, pH is 7.6, no hardness data, dissolved solids is 148 mg/L, specific conductance is 215 micromhos.

Dmt
Dmt

MAHANTANGO FORMATION

Silty shale and shaly siltstone, gray. Tully Member (Dmt) limestone; occurs at top of formation.

One-hour specific capacity is 0.3 (gal/min)/ft for domestic wells and 1.0 (gal/min)/ft for nondomestic wells; average nondomestic well produces 56 gal/min, maximum reported yield is 240 gal/min, water level is 17 feet below land surface; pH is 6.9, hardness is 5 gpg; dissolved solids is 165 mg/L; specific conductance is 215 micromhos. One-hour specific capacity is 0.25 (gal/min)/ft for domestic wells in Tully Member.

Dmr

MARCELLUS FORMATION

Shale, sooty black, laminated, massive beds.

One-hour specific capacity is 0.12 (gal/min)/ft for domestic wells, maximum reported yield is 24 gal/min; water level is 37 feet below land surface, pH is 7.0, hardness is 6 gpg, dissolved solids is 122 mg/L, specific conductance is 185 micromhos.

Don

ONONDAGA FORMATION

Shale, gray, fissile, massive beds. Limestone in upper part.

One-hour specific capacity is 0.08 (gal/min)/ft for domestic wells and 7.5 (gal/min)/ft for two nondomestic wells, maximum reported yield is 555 gal/min, water level is 22 feet below land surface, pH is 7.0, hardness is 7 gpg; specific conductance is 250 micromhos.

Do

OLD PORT FORMATION

Limestone, gray, locally shaly, thick beds, containing lenses of black chert. Ridgeley Member sandstone, white to gray, friable, occurs at top of formation.

One-hour specific capacity is 0.53 (gal/min)/ft for domestic wells and 8.1 (gal/min)/ft for nondomestic wells, average nondomestic well produces 280 gal/min, most high-yield wells are in Ridgeley Member; maximum reported yield is 503 gal/min; water level is 32 feet below land surface, pH is 7.0, hardness is 7 gpg, dissolved solids is 340 mg/L, specific conductance is 480 micromhos.

DSk

KEYSER FORMATION

Limestone, gray, fossiliferous, thin- to medium-bedded.

One-hour specific capacity is 3.1 (gal/min)/ft for domestic wells and 8.8 (gal/min)/ft for nondomestic wells, average nondomestic well produces 255 gal/min, maximum reported yield is 860 gal/min, water level is 25 feet below land surface, pH is 7.5, hardness is 15 gpg, dissolved solids is 415 mg/L, specific conductance is 500 micromhos.

SILURIAN

Sto

TONOLOWAY FORMATION

Limestone, gray, laminated.

One-hour specific capacity is 1.3 (gal/min)/ft for domestic wells and 5 (gal/min)/ft for nondomestic wells, average nondomestic well produces 150 gal/min, maximum reported yield is 535 gal/min, water level is 59 feet below land surface, pH is 7.4, hardness is 17 gpg, dissolved solids is 570 mg/L, specific conductance is 650 micromhos.

Swc

WILLS CREEK FORMATION

Shale and siltstone, gray to olive-gray, calcareous, interbeds of dolomite and limestone.

One-hour specific capacity is 1.5 (gal/min)/ft for domestic wells and 4.5 (gal/min)/ft for one nondomestic well, average nondomestic well produces 50 gal/min, maximum reported yield is 150 gal/min, water level is 29 feet below land surface, pH is 6.9, hardness is 18 gpg, dissolved solids is 453 mg/L.

Sb

BLOOMSBURG FORMATION

Silty claystone, grayish red, some limestone and calcareous shale in middle part.

One-hour specific capacity is 0.38 (gal/min)/ft for domestic wells and 4.2 (gal/min)/ft for nondomestic wells, average high-yield well produces 120 gal/min, maximum reported yield is 166 gal/min, water level is 22 feet below land surface, pH is 6.8, hardness is 6 gpg, specific conductance is 250 micromhos.

Sm

MIFFLINTOWN FORMATION

Limestone, gray, some interbeds of red claystone in upper part.

One-hour specific capacity is 0.12 (gal/min)/ft for domestic wells and 6.3 (gal/min)/ft for one nondomestic well, maximum reported yield is 100 gal/min, water level is 60 feet below land surface, no chemical-quality data available.

Sr

ROSE HILL FORMATION

Silty shale and siltstone, gray, thin-bedded.

One-hour specific capacity is 0.16 (gal/min)/ft for domestic wells, maximum reported yield is 150 gal/min, water level is 12 feet below land surface, pH is 7.0, hardness is 4 gpg, dissolved solids is 107 mg/L, specific conductance is 140 micromhos (water-quality data from one well). Salt water was found in well Ly-263.

St

TUSCARORA FORMATION

Quartzite, olive-gray, some beds of siltstone and silty shale.

Insufficient data for hydrologic evaluation.

ORDOVICIAN

Ojv
Ojl

JUNIATA FORMATION

Sandstone, siltstone, and silty shale in lower part, sandstone in upper part, grayish red.

One-hour specific capacity is 0.22 (gal/min)/ft for domestic wells, maximum reported yield is 30 gal/min, water level is 31 feet below land surface, pH is 6.0, hardness is 2 gpg, dissolved solids is 42 mg/L, specific conductance is 70 micromhos.

Obe

BALD EAGLE FORMATION

Sandstone, gray to greenish-gray, thick-bedded; some interbeds of siltstone and shale, gray.

One-hour specific capacity is 0.09 (gal/min)/ft for domestic wells, maximum reported yield is 20 gal/min, pH is 6.5, hardness is 1 gpg, total dissolved solids is 31 mg/L, specific conductance is 55 micromhos.

Or

REEDSVILLE FORMATION

Shale, silty, and shaly siltstone, gray to olive-gray, some beds of sandstone, some fossiliferous siltstone.

One-hour specific capacity is 0.09 (gal/min)/ft for domestic wells, maximum reported yield is 100 gal/min, water level is 72 feet below land surface, pH is 6.0, hardness is 5 gpg, dissolved solids is 110 mg/L, specific conductance is 200 micromhos.

Oa

ANTES FORMATION

Shale, black, calcareous, fissile, some interbeds of limestone, gray.

One-hour specific capacity is 0.14 (gal/min)/ft for domestic wells, maximum reported yield is 45 gal/min, water level is 41 feet below land surface, pH is 7.5, hardness is 9 gpg, dissolved solids is 200 mg/L, specific conductance is 330 micromhos.

Oc

COBURN FORMATION

Limestone, gray, medium-bedded.

One-hour specific capacity is 0.12 (gal/min)/ft for domestic wells, maximum reported yield inventoried for wells is 10 gal/min, water level is 55 feet below land surface, no water-quality data available.

Os

SALONA FORMATION

Limestone, gray, medium-bedded.

One-hour specific capacity is 0.15 (gal/min)/ft for domestic wells, maximum reported yield for inventoried wells is 30 gal/min, water level is 191 feet below land surface (water level from three deep wells), no water-quality data available.

Orm

RODMAN FORMATION

Limestone, gray, thin- to thick-bedded; some beds are fossiliferous.

One-hour specific capacity is 0.03 (gal/min)/ft for one domestic well; yield for same well was 3 gal/min, and water level was 210 feet below land surface (well was 320 feet deep); no water-quality data available.

Olh

LINDEN HALL FORMATION

Limestone, gray, medium- to thick-bedded, buff-colored dolomite tubes in lower part.

One-hour specific capacity is 0.25 (gal/min)/ft for domestic wells, maximum reported yield is 60 gal/min, water level is 119 feet below land surface, pH is 7.5, hardness is 20 gpg, dissolved solids is 355 mg/L, specific conductance is 560 micromhos.

Osn

SNYDER FORMATION

Limestone, gray; interbeds of magnesium limestone, dark-gray, some touch-bash limestone.

One-hour specific capacity is 5.6 (gal/min)/ft for domestic wells, maximum reported yield is 60 gal/min; water level is 100 feet below land surface, pH is 7.0; hardness is 28 gpg; specific conductance is 775 micromhos (water-quality data from one well).

Oh

HATTER FORMATION

Dolomite and limestone, gray, medium- to thick-bedded.

One-hour specific capacity is 0.66 (gal/min)/ft for one domestic well and 22 (gal/min)/ft for the average of two nondomestic wells, maximum reported yield is 59 gal/min, water level is 120 feet below land surface, pH is 7.4, hardness is 31 gpg; dissolved solids is 650 mg/L.

Ol

LOYSBURG FORMATION

Limestone and magnesium limestone, gray and light-gray interbeds give "tiger stripe" appearance, laminated to thick bedded.

One-hour specific capacity is 0.27 (gal/min)/ft for one domestic well, maximum reported yield is 12 gal/min, water level is 70 feet below land surface, pH is 6.5, hardness is 10 gpg, specific conductance is 270 micromhos (water-quality data from one well).

Obf

BELLEFONTE FORMATION

Dolomite, gray (buff color on weathered surfaces), laminated, medium- to thick-bedded; some interbeds of limestone, gray and laminated.

One-hour specific capacity is 0.16 (gal/min)/ft for domestic wells, maximum reported yield is 8 gal/min; water level is 75 feet below land surface, pH is 7.7, hardness is 20 gpg; dissolved solids is 340 mg/L, specific conductance is 600 micromhos.

[1] Geologic descriptions are in black type, hydrologic descriptions are in blue type. Values given in hydrologic descriptions are median values, unless otherwise specified.

PHYSICAL, HYDROLOGIC AND WATER-QUALITY CHARACTERISTICS FOR WELLS COMPLETED IN QUATERNARY VALLEY-FILL DEPOSITS

Aquifer and well type	Percent areal distribution	Reported well depth (feet) N[2]	R[3]	M[4]	Reported casing depth (feet) N	R	M	Reported water level (feet below land surface) N	R	M	Reported yield (gallons per minute) N	R	M	One hour specific capacity (gallons per minute per foot of drawdown) N	R	M	pH N	R	M	Total hardness as $CaCO_3$ (grains per U. S. gallon) N	R	M	Specific conductance (micromhos at 25°C) N	R	M
Quaternary valley-fill deposits	[illegible]																									
Domestic wells		16	11-102	45	35	21-105	46	13	2-70	12	18	5-100	24	10	0.5-12.5	2.0	8	5.0-6.5	5.7	9	1-5	4	4	140-190	168
Nondomestic wells[1]		34	22-126	36	31	15-103	30	32	5-34	10	35	10-3,014	300	29	5.0-417	32	9	5.5-7.0	6.0	15	1-10	5	14	60-380	210

[1] Nondomestic means municipal and industrial
[2] N is number of values.
[3] R is range of values
[4] M is median value

EXPLANATION

SATURATED THICKNESS OF VALLEY-FILL DEPOSITS

0-20 feet

20-40 feet

Over 40 feet

358/65C ● Well penetrating bedrock

255/301 ○ Well producing from valley-fill deposits

40 ● Test hole, boring or relief well

Numbers in black type are county well numbers. Numbers in red type represent saturated thickness of deposit, in feet. C indicates that thickness was estimated from casing depth. L indicates that thickness was estimated from driller's log.

Boundary of valley-fill deposits

500

Line of equal water level (approximate)
Number is altitude, in feet, above mean sea level. Contour intervals are 20 feet and 100 feet. Data were compiled from both measured and reported water levels and the altitudes of stream and topographic-contour intersections of 7-1/2-minute quadrangle maps.

PLATE 2. GENERAL ALTITUDE OF THE WATER TABLE IN, AND SATURATED THICKNESS OF, VALLEY-FILL DEPOSITS IN THE WILLIAMSPORT REGION